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REPORTS

TO THE

LOCAL GOVERNMENT BOARD

ON

PUBLIC HEALTH AND MEDICAL SUBJECTS.

(NEW SERIES No. 88.)

I. The Incidence and Bacteriological Characteristics of Tuberculous Infection in Children; by Arthur Eastwood, M.D., and Fred Griffith, M.B.

II. An Enquiry, based on a series of Autopsies, into the Occurrence and Distribution of Tuberculous Infection in Children, and its Relation to the Bovine and the Human Types of Tubercle Bacilli respectively; by A. Stanley Griffith, M.D.

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The following is a list of some Parliamentary and Official Publications :—

TUBERCULOSIS.

DEPARTMENTAL COMMITTEE appointed by Treasury Minute of 22nd February, 1912, to report upon the considerations of general policy in respect of the problem of Tuberculosis in the United Kingdom, in its preventive, curative, and other aspects, which should guide the Government and local bodies in making or aiding provision for the treatment of Tuberculosis in sanatoria or other institutions or otherwise.

INTERIM REPORT.

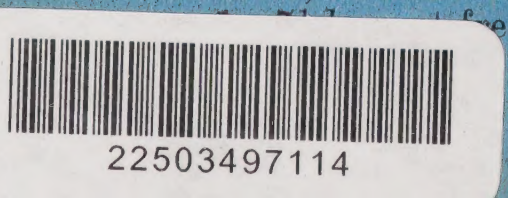
Deals mainly with the essential features and broad lines of a comprehensive scheme for the provision of immediate treatment for the existing tuberculous population. [Cd. 6164] of Session 1912-13. Price 3*d*., post free 4*d*.

FINAL REPORT.

Deals mainly with the measures which should be taken for the prevention of Tuberculosis in general, with special reference to the questions relating to bovine tuberculosis and tuberculosis in children, and to a scheme for dealing with the money available under the National Insurance Act for the purposes of research. [Cd. 6641] of Session 1913. Price 2½*d*., post free 3*d*.

APPENDIX.

Contains memoranda submitted on the following subjects in relation to Tuberculosis :—Bovine Tuberculosis; Children; Compulsory Notification; Diagnosis; Dispensary; Finance; General Practitioners; Hospitals; Housing; Sources of Infection; Meat; Milk; Non-pulmonary Tuberculosis; Prevention; Research; Sanatoria; Treatment; &c. [Cd. 6654] of Session 1912-13. Price [illegible] free 1*s*. 11½*d*.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PREFATORY NOTE BY THE MEDICAL OFFICER OF THE BOARD.

The first of the following reports (pages 1–104) gives an account of an investigation into the incidence and bacteriological characteristics of tuberculous infection in children, which—with investigations on swine tuberculosis and on other problems of tuberculosis having immediate practical importance—has occupied most of the time of Drs. Eastwood and F. Griffith in the Board's Pathological Laboratory during the last three years.

The object of the present enquiry was to investigate the incidence of tuberculous infection in a series of children dying *from all causes* between the ages of two and ten years, and to determine whether in their bacteriological characteristics the bacilli found conformed to the "bovine" or the "human" type. The presence or absence of tubercle bacilli in the bronchial and mesenteric glands was ascertained, these glands being examined not only by dissection and microscope, but also by culture and biological tests, whether there was naked-eye evidence of tuberculosis or not.

In view of the importance of the subject, it was arranged that a parallel investigation should be undertaken at Cambridge by Dr. A. S. Griffith. His report is given on pages 105–166 of this volume. The main results of the two investigations are stated in combination in the following table :—

Series of 195 *deaths from all causes between the ages of two and ten years.*

Age Periods.	Number of Cases.			Classification of Cultures isolated.		
	Free from Tubercle bacilli.	Tubercle bacilli dead.	Tubercle bacilli living.	Bovine.	Human.	Mixed bovine and human.
2–3 years	27	1	19	6	13	—
3–4 „	12	2	21	4	17	—
4–5 „	14	4	14	1	13	—
5–6 „	12	3	15	—	14	1
6–7 „	1	3	16	3	13	—
7–8 „	3	2	2	—	2	—
8–9 „	4	2	4	1	3	—
9–10 „	4	3	7	2	5	—
Totals ...	77	20	98	17	80	1

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The first report deals with the examination of material from 150 children, and the second is primarily* concerned with material from 45 children ; all these children had died in various hospitals, none of which were specially devoted to the treatment of tuberculous patients.

The incidence of tuberculous infection among these 195 children was 62·7 per cent. in the first series of 150, and 53·3 per cent. in the second series of 45 children (*see* Table on next page). Of the total 195 children, 118, or 60·5 per cent. showed evidence of tuberculous infection. The condition found in these 118 was as follows :—In 92 (47·2 per cent. of 195 or 78·0 per cent. of 118) tuberculous lesions, verified by subsequent cultures, were found, in six (3·1 per cent. of 195 or 5·1 per cent. of 118) living bacilli were obtained in culture, but there were no tuberculous lesions ; and in 20 (10·3 per cent. of 195 or 16·9 per cent. of 118) tuberculous lesions were present, but the tubercle bacilli apparently were dead.

These statistics evidently do not justify a direct inference as to the extent of the incidence of tuberculous infection in the general juvenile population. They deal with a hospital population, affected by fatal disease, of some kind or other, or, in a few cases, by trauma. It has to be noted also that in some of the cases in which living tubercle bacilli were found there were no tuberculous lesions. Moreover, cases in which tuberculous lesions are discoverable are not necessarily associated with or followed by symptoms of tuberculous disease. At the same time the seriousness of the mortality directly attributable to tuberculosis is evinced by the fact that, in the first of the present series of cases, 61 out of the 94 children showing evidence of infection with tubercle bacilli had died from this disease.

Tuberculosis is a common cause of death in childhood, and the investigation shows that, apart from fatal cases of this disease, tuberculous lesions are common in sick children. It shows also that living tubercle bacilli may be present in their tissues apart from or in the absence of such lesions, and that tuberculous lesions may heal, inasmuch as the bacilli responsible for them may be dead.

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* Dr. A. S. Griffith also investigated 17 cases of ages less than 2 years, 3 cases of ages between 10 and 12 years, and 8 cases from institutions where tuberculous cases alone were available for his investigation. *See* page 122.

—	1st series. (Drs. Eastwood and F.Griffith).	2nd series. (Dr. A. S. Griffith).	Both series.	Percentages.		
				1st series.	2nd series.	Both series.
Total children dying from all causes	150	45	195	100	100	100
Number showing evidence of infection with tubercle bacilli	94	24	118	62·7	53·3	60·5
Of this number the tubercle bacilli were apparently dead but there were lesions in	16	4	20	10·7	8·9	10·3
Of this number lesions were present and tubercle bacilli were obtained in culture in	73	19	92	48·7	42·2	47·2
Of this number no lesions were present but tubercle bacilli were obtained in culture in	5	1	6	3·3	2·2	3·1

The characters of the tubercle bacilli found in the lesions were the main subject of the investigation. Those strains were regarded as "bovine" which culturally and in their pathogenicity for rabbits resembled tubercle bacilli of bovine origin; and, in accordance with the usually accepted distinction between bovine and human types of tubercle bacilli, strains were regarded as "human" which differed from the bovine in their greater cultural luxuriance and in their lower pathogenicity for rabbits. One of the strains in the first series did not accord with either of these groups, but is classed as "bovine" from its cultural characters: and in one case in the second series bacilli both of the bovine and the human type were present.

In the first series, of the total 78 cases in which cultures of tubercle bacilli were obtained, 65, or 83·3 per cent. of this total yielded tubercle bacilli of the human type; and in the second series the corresponding percentage was 80 (*i.e.*, out of 20 cases yielding cultures, "human" strains were obtained in 16*).

Bovine bacilli were obtained, in the first series, in 13 cases, or 16·7 per cent. of the 78 yielding cultures; in the second series 5* cases yielded bovine bacilli, or 25 per cent. of the 20 yielding cultures.

* The case of mixed infection is counted twice.

—	1st series.	2nd series.	Both series.	Percentages. 1st series.	2nd series.	Both series.
Total children dying from all causes who yielded cultures of tubercle bacilli	78	20	98	—	—	—
Bacilli of human type ...	65	16*	81*	83·3	80	82·7
Bacilli of bovine type ...	13	5†	18†	16·7	25	18·4

* Including one where "bovine" bacilli were also present.
† „ „ "human" „ „ „

Of the 98 cases comprised in the above table 17 showed bovine bacilli alone, and in 11 of these 17 death was directly attributable to tuberculosis.

The data contained in the two reports show that among the children carefully examined in this investigation, in which living tubercle bacilli were found, infection of human origin accounted for about five-sixths of the cases, while about one-sixth of them were of bovine origin. The reports give in exact detail the tests employed in determining the "human" or "bovine" character of the bacillus; and in accordance with the conclusions of the Royal Commission on Tuberculosis, it is assumed that the distinctions between the two types of bacilli have differential significance as to the human or animal source of infection.

These figures, while showing the greater importance of infection of human source, illustrate also the danger of cow's milk as a source of tuberculosis in childhood, and corroborate the conclusions upon this subject which were arrived at by the recent Royal Commission on Tuberculosis. In one important respect they supplement the work of that Commission, because they are based on material from an unselected series of deaths, whereas, as Dr. A. S. Griffith points out, on page 105, the material investigated for the Commission was selected, special attention being devoted to cases where the portal of entry of the bacillus was presumably alimentary.

Dr. A. S. Griffith also quotes, on page 106, certain German investigations where the proportion of cases in which the infection was shown to be of the human type was much higher than in the two series embodied in the present reports. These German data may be supplemented by the

quotation from recent German literature given in the footnote below.*

The investigations fully reported in this volume show that, in the causation of human tuberculosis, infection of human and of bovine origin, both have great importance. Most of the material examined was derived from the metropolis. It illustrates, so far as this series of cases is concerned, the proportion of human and bovine infection by tuberculosis among children dying in London in hospitals other than those for tuberculosis. It is possible that in a subsequent series, and in series derived from sources other than hospitals, the amount of tuberculosis and the proportion between tuberculosis of human and of bovine source may differ materially; also that this amount and proportion will vary in different

---

* In 1912, Cornet and Kossel published the following table, summarising the types of tubercle bacilli found in cases of human tuberculosis by various investigators (Kolle and Wassermann's *Handbuch der pathogenen Mikroorganismen*, 2nd edition, Vol. V., page 458).

Type of Disease.	Total number of cases investigated.	Cultural Characters.			Percentage of cases with bovine bacilli. A=persons over 16 years of age. C=persons under 16 years of age.
		Human.	Bovine.	Avian.	
Pulmonary tuberculosis	732*	728	4	1	A= ·56 per cent. 4 : 707 C= 0 „ 0 : 25
Tuberculosis of bones and joints..	98*	94	5	—	A= 7 „ 2 : 29 C= 4·3 „ 3 : 69
Meningeal tuberculosis	32	29	3	—	A= 0 „ 0 : 4 C=10·7 „ 3 : 28
Generalised tuberculosis	172†	141	33	1	A= 2·5 „ 1 : 40 C=23·8 „ 32 : 134
Tuberculosis of cervical glands ...	157	112	45	—	A= 6 „ 3 : 51 C=40 „ 42 : 106
Abdominal tuberculosis	99‡	70	30	1	A=13·6 „ 7 : 51 C=49 „ 23 : 47
	1,290§	1,174	120	3	

* Including 1 case of mixed infection (human and bovine) in 1 A.
† „ 3 cases „ „ „ „ „ „ 3 C.
‡ „ 2 „ „ „ „ „ „ 2 A.
§ „ 7 „ „ „ „ „ „ 3 A and 4 C.

Cornet and Kossel point out that the relative frequency of the various clinical types of tuberculosis does not correspond to the proportion of each type bacteriologically examined, pulmonary tuberculosis being the most frequent type of the disease, and the chief cause of death from tuberculosis.

centres of population. This can only be determined in the light of further investigations on similar lines, and it is desirable that such investigations should be made.

ARTHUR NEWSHOLME.

January 15th, 1914.

The Incidence and Bacteriological Characteristics of Tuberculous Infection in Children; by Arthur Eastwood, M.D., and Fred Griffith, M.B.

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Introduction.

The enquiry which forms the subject of this report was conducted in co-operation with physicians and pathologists attached to various hospitals within or adjacent to the County of London. To all these gentlemen we wish to express our thanks for their courtesy in providing us with clinical and post-mortem notes and in enabling us to make personal examination and selection of the material requisite for bacteriological research.

None of the hospitals affording material for investigation were institutions specially devoted to the care of tuberculous patients and in only one, from which four cases were obtained, was the proportion of patients suffering from tuberculosis particularly large.

The objects of the enquiry were to investigate the incidence of tuberculous infection in a series of children dying from all causes between the ages of two and ten years and to determine the bacteriological characters of the tubercle bacilli which were found. It was arranged that every case within this age period which came to the post mortem rooms should be examined until a total of 150 cases had been obtained. The period during which these cases were obtained was from June 4th, 1912 to February 3rd, 1913.

The research was primarily directed to determining the presence or absence of tubercle bacilli in the bronchial and mesenteric glands. At the same time other tissues also were examined for tubercle bacilli when presenting features of special interest, and the record of visibly tuberculous lesions throughout the body was made as complete as possible.

Method of Investigation.

In the post-mortem examination of the tissues special care was taken to avoid incisions of the bronchial and mesenteric glands which would make them unsuitable for bacteriological work.

When the bronchial glands were enlarged and obviously tuberculous, the surfaces of a few suitable nodules were cauterised and the subjacent caseous tissue was removed with sterile precautions, a portion being used for culture on egg medium and the remainder for inoculation of guinea-pigs. When these glands did not appear tuberculous on preliminary inspection, they were located by search about the trachea and the roots of the lungs, care being taken to avoid rupture of the pleural covering. They were then dissected out after searing the surface, as many as possible being removed, generally from five to eight. These were emulsified and inoculated intraperitoneally into guinea-pigs, not less than three animals being used when minute search failed to reveal visible tuberculosis. A portion of the emulsion was kept in reserve, in case the guinea-pigs died prematurely owing to the presence of infective organisms other than tubercle bacilli. When this occurred, inoculations were made with the remainder of the

material, preliminary treatment with from ½ to 1 per cent. antiformin for half an hour being adopted in a few cases where the toxicity of the original material was particularly high.

The mesenteric glands, when enlarged and obviously tuberculous, were dealt with in the same way as bronchial glands of similar nature. When the mesenteric glands were small and not obviously affected, the mesentery was carefully dissected from the intestine and removed in one piece, care being taken to avoid tearing the peritoneal covering of the glands on either side. It was then pinned out on a small dissecting board; the upper peritoneal surface was seared and the glands were dissected out, from ten to twelve being usually removed. The emulsion of these glands was used in the same way as the emulsions of apparently normal bronchial glands.

Cultures and animal inoculations were also made from other organs, (*a*) when they contained tuberculous lesions and none were found in the bronchial or mesenteric glands, (*b*) to clear up the diagnosis of a doubtful nodule, and (*c*) in certain cases where it was thought of interest to ascertain whether the tubercle bacilli obtained from various sites of the body all possessed the same characteristics.

The guinea-pigs were killed six weeks after inoculation, if not obviously tuberculous at an earlier date, and cultures were made from the lesions found.

The cultural characters of the strains obtained either directly or through the guinea-pig were tested on various media and their virulence for rabbits was determined by inoculation of weighed quantities of culture grown on pure bovine serum.

General Results.

The following table (Table I., p. 4) gives a brief summary of the general results of the enquiry.

In the cases recorded as showing no evidence of infection with tubercle bacilli, no visible lesions of tuberculosis could be found in any part of the body, and the inoculation experiments with emulsions of the bronchial and mesenteric glands were negative in every instance. (*See* Table III., p. 52.)

In the remaining cases there was evidence of infection with tubercle bacilli, with, in the majority of instances, the formation of visible tuberculous lesions from which the bacilli were recovered in culture. In some cases, however, though visible lesions were present and tubercle bacilli could generally be demonstrated in smear preparations from them, the bacilli were apparently dead, as the cultural and inoculation experiments all yielded negative results (*see* Table IV., p. 56). And tubercle bacilli, were derived, through the guinea-pig, from apparently normal lymphatic glands in a few cases where no visible lesions of tuberculosis could be found in any part of the body. (*See* Table V.A, p. 60.)

In a large proportion of the cases of tuberculous infection, this disease was the cause of death; in the remainder, varying degrees of tuberculosis were present but death was due to some other cause.

The terms "bovine" and "human" tubercle bacillus in Table I. are used as convenient abbreviations for the fuller bacteriological data which will be found in later pages of the report (pp. 71-4). Those strains are termed "bovine" which culturally and in experiments on rabbits resemble tubercle bacilli of bovine origin. The "human" strains were unlike these in their greater cultural luxuriance and in their lower pathogenicity for rabbits. This is the usually accepted distinction between bovine and human types of tubercle bacilli. But one of our strains, H 99, cannot be accurately described as either "human" or "bovine" in accordance with the above definition. In its scanty cultural growth on test media it is identical with typical bacilli of bovine origin, but, unlike such bacilli, its virulence for the rabbit is extremely low (*see* Table VI., p. 76). In Table I. this virus is included amongst the "bovine" cases.

Table I.—Statistical Results in a series of 150 *Children Dying from all causes between the ages of* 2 *and* 10 *years.*

Results.	Number of cases.	Percentages.
No evidence of infection with tubercle bacilli.	56	37·3 per cent. of the 150 cases.
Evidence of infection with tubercle bacilli.	94	62·7 " " "
Lesions of tuberculosis but bacilli apparently dead.	16	10·7 " " "
		17 " " 94 tuberculous cases.
		18 " " 89 tuberculous cases with visible lesions.
Lesions of tuberculosis and cultures obtained.	73	
No lesions of tuberculosis but cultures obtained.	5	78
		52 " " 150 cases.
		83 " " 94 tuberculous cases.
Death due to tuberculosis ...	61	40·7 " " 150 cases.
		64·9 " " 94 tuberculous cases.
Evidence of tuberculosis, but death due to other causes.	33	22 " " 150 cases.
		35·1 " " 94 tuberculous cases.
Infection by the "human" bacillus.	65	43·3 " " 150 cases.
		83·3 " " 78 cases yielding cultures.
Fatal infection by the "human" bacillus.	52	80 " " 65 "human" infections.
Infection by the "bovine" bacillus.	13	8·7 " " 150 cases.
		16·7 " " 78 cases yielding cultures
Fatal infection by the "bovine" bacillus	9	69·2 " " 13 "bovine" infections.

The Distribution of Lesions and Tubercle Bacilli.

In the 94 out of our series of 150 cases in which evidence of tuberculosis was found, we made the following analysis of the distribution of lesions and tubercle bacilli with a view to determining what indications it affords as to the usual portals of entry of this organism.

In 22 cases the anatomical evidence was strongly in favour of the glands directly draining the alimentary tract as being primarily infected. In 3 of these cases the bacilli were of human type, in 12 they were of bovine type (including H 99), and in 7 they were apparently dead.

In 52 cases the anatomical evidence was definitely in favour of primary infection through the respiratory tract. In 43 of these cases the bacilli were of human type, in one they were bovine, and in eight they were apparently dead.

In 20 cases the anatomical evidence as to the portal of entry was inconclusive. In 19 of these cases the bacilli were of human type, and in one they were apparently dead.

In several instances inoculation experiments on guinea-pigs have revealed the presence of tubercle bacilli in mesenteric or bronchial glands where no visible lesions of tuberculosis could be found on minute dissection and special examination in a good light.

Five of the children where this latency of tubercle bacilli was demonstrated presented no macroscopic evidence of tuberculosis in any part of the body. In three of these five the bacilli were of bovine type; they were recovered from the mesenteric glands of two children and from the bronchial glands of a third. In the remaining two the bacilli were of human type; in one case they were recovered from the cervical, bronchial, and mesenteric glands, in the second from the mesenteric glands alone.

Examples of tubercle bacilli lying latent in mesenteric or bronchial glands of children showing tuberculosis in some other part of the body occurred in five instances with bovine tubercle bacilli (once in mesenteric glands and four times in bronchial glands), and in 17 instances with human tubercle bacilli (13 times in mesenteric glands and four times in bronchial glands).

In six of the cases investigated there were tuberculous lesions in one or more bones or joints, and in a seventh there was a history of lupus. No bacteriological examination of these lesions was made, but it is of interest to note the type of tubercle bacilli obtained from other situations in the bodies of these children. In H 1 no living tubercle bacilli were recoverable, though the bronchial glands were macroscopically tuberculous and tubercle bacilli were found in smears. In H 3, H 38, H 83, H 89 (the lupus case) and H 120, tubercle bacilli of human type were recovered from both bronchial and mesenteric glands. In H 99 the bronchial glands were found free from tubercle bacilli, but from the mesenteric glands a virus was obtained which grew culturally like the bovine tubercle bacillus though of low experimental virulence for rabbits.

The following table (Table II.) provides a general survey of the distribution of infection with bovine tubercle bacilli. In the case of H 76 there was no evidence of entrance by the alimentary tract; the mesenteric glands were tested on guinea-pigs and found free from tubercle bacilli.

Table II.—Cases Yielding Tubercle Bacilli of "Bovine" Type.

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Tissues macroscopically tuberculous.	Tissues from which "bovine" tubercle bacilli were isolated.
14	10	M.	History of ascites; death from wasting and diarrhœa; extreme fatty change in liver.	None	Mesenteric glands.
16	$6\frac{11}{12}$	F.	Morbus cordis ...	Mesenteric glands ...	Mesenteric glands.
27	$2\frac{1}{4}$	F.	Tuberculous peritonitis; general tuberculosis.	Caseation of mesenteric and bronchial glands; miliary tubercles in lungs and kidneys; caseous nodules in pericardium.	Bronchial glands; mesenteric glands; pericardium.
37	$2\frac{1}{2}$	F.	Abdominal tuberculosis; tuberculous bronchopneumonia.	Intestinal ulceration; extensive tuberculosis of mesenteric glands; numerous caseous nodules in both lungs; bronchial glands slightly affected.	Bronchial glands; mesenteric glands.
41	3	F.	Tuberculous mesenteric glands; tuberculous meningitis.	Meninges; mesenteric glands; intestine; spleen; a few minute tubercles in lungs; bronchial glands apparently normal.	Bronchial glands; mesenteric glands.
47	$2\frac{3}{4}$	M.	Tuberculous peritonitis and meningitis.	Fairly numerous miliary tubercles in lungs; mesenteric glands extensively tuberculous; intestines ulcerated; bronchial glands apparently normal.	Bronchial glands; mesenteric glands.
50	8	M.	Morbus cordis ...	None	Mesenteric glands.
76	4	M.	Anæmia	None	Bronchial glands.
96	$2\frac{5}{6}$	M.	Tuberculous meningitis.	Meninges; a few grey foci in liver; (mesenteric glands apparently normal).	Liver; mesenteric glands.
99	$9\frac{3}{4}$	M.	Spinal caries; tuberculous rib with discharging sinus; albuminuria; ascites.	Mesenteric glands; spleen.	Mesenteric glands.

No. of Case	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Tissues macroscopically tuberculous.	Tissues from which "bovine" tubercle bacilli were isolated.
105	$2\frac{3}{4}$	F	Tabes mesenterica; tuberculous peritonitis.	Lungs; mesenteric glands; intestines; spleen; kidneys; (bronchial glands apparently normal).	Bronchial glands; mesenteric glands.
121	6	M.	Tuberculous meningitis.	Meninges; discrete tubercles in lungs; mesenteric glands; spleen; liver.	Liver; spleen.
140	6	M.	Intestinal tuberculosis; perforation.	Mesenteric glands; intestine; (bronchial glands apparently normal).	Bronchial glands; mesenteric glands.

Details of the 94 Tuberculous Cases.

H 1.

F. C., 7 years; male.—Tuberculous hip disease; ruptured tuberculous gland in region of appendix; peritonitis. The von Pirquet cutaneous reaction was reported definitely positive to human tuberculin and faintly so to bovine tuberculin.

Bronchial Glands.—Attached to the trachea, within the bifurcation of the trachea, and above each bronchus the glands contained, or were replaced by, calcareous nodules, in which one or two tubercle bacilli were seen. Three guinea-pigs were inoculated but failed to develop tuberculosis in six weeks.

Lungs.—On the left lung, attached to the pleura and moveable over the lung tissue, was a minute grey tubercle with an opaque centre, containing a moderate number of well staining tubercle bacilli. In the parenchyma of this lung were six nodules, about the size of millet seeds, composed of grey tissue slightly opaque in the centre and containing a few long tubercle bacilli. No nodules were found in the right lung.

Mesenteric Glands.—Normal, with the exception of one calcareous grain about the size of a rape seed. Two guinea-pigs inoculated with gland tissue failed to develop tuberculosis in six weeks.

Spleen.—No visible tuberculosis. Three guinea-pigs failed to develop tuberculosis in six weeks.

Summary.

Cultures were made from the bronchial glands and from six of the guinea-pigs; all the tubes remained sterile. Evidence as to portal of entry inconclusive.

H 2.

T. W. G. S., 5 years; male.—Ten months' history of phthisis; cavitation of both lungs; general tuberculosis.

Cervical Glands.—Enlarged and fibroid; one contained an encapsuled caseo-calcareous nodule, in which no tubercle bacilli were seen. Tuberculosis was produced in two guinea-pigs.

Bronchial Glands.—Moderately enlarged; fibroid on section. In the gland at the bifurcation of the trachea was a small caseous, gritty patch; in a gland on the left bronchus was a similar but larger patch; no caseation was found in the glands on the right bronchus. General tuberculosis was produced in two guinea-pigs and omental tuberculosis only in a rabbit inoculated intraperitoneally.

Lungs.—Large and congested; lobes adherent. In the left lung there was a cavity in the upper lobe about the size of a pigeon's egg, and on section this lung was found riddled with small cavities and caseous patches, many of which were softening; a smear from the muco-pus in one of the cavities showed moderately numerous tubercle bacilli. The right lung showed pigmented fibro-caseous patches and caseous nodules, with only an occasional cavity, the disease being much less severe than on the left side.

Mesenteric Glands.—All enlarged, varying in size up to a thrush's egg; firm, and completely or partially replaced by firm, yellowish white, caseous material, containing a few tubercle bacilli. General tuberculosis was produced in two guinea-pigs but a rabbit inoculated intraperitoneally was found healthy 100 days afterwards.

Spleen.—Just beneath the capsule was a yellowish caseo-calcareous tubercle about the size of a rape seed; on section, four similar tubercles were found. No tubercle bacilli were seen in smear preparations. Tuberculosis was produced in three guinea-pigs.

Kidneys.—The left showed two minute, greyish foci, containing tubercle bacilli.

Intestines.—Tubercular ulceration of all the Peyer's patches; tubercle bacilli numerous.

Summary.

Cultures were obtained directly from the bronchial and mesenteric glands and, through a guinea-pig, from the spleen. They were all eugonic in growth. Tested on rabbits, the bronchial and mesenteric cultures were of low* virulence. Evidence as to portal of entry inconclusive.

H 3.

B. A. F., 3 years; female.—Tubercular dactylitis; spinal caries; tuberculous pneumonia. Von Pirquet reaction to bovine tuberculin reported positive.

Cervical Glands.—Four were enlarged, the largest measuring 2·5 × 1·5 × ·7 cm.; on section their substance was firm, with areas of caseation, not breaking down; tubercle bacilli were moderately numerous. General tuberculosis was produced in two guinea-pigs.

Bronchial Glands.—Only slightly enlarged, congested; no caseation. In a smear one tubercle bacillus was seen. The anti-forminised tissue produced general tuberculosis in a guinea-pig.

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* In this and the following summaries the term "low" is used relatively, meaning of lower virulence than is characteristically exhibited by typical viruses of bovine origin.

Lungs.—Firm and congested, but just floated in water; right lobes adherent to each other and to chest wall; a mass of caseous substance between right lung and chest wall. On section, both lungs were closely filled with caseating tubercles and scattered throughout were small collections of soft, caseo-purulent substance, which contained tubercle bacilli in large numbers. The antiforminised tissue produced general tuberculosis in two guinea-pigs and slight tuberculosis in a rabbit, killed 93 days after intraperitoneal inoculation, from which a eugonic culture was obtained.

Mesenteric Glands.—Two glands, each about 1·5 × ·7 × ·5 cm., showed on section fibro-caseous areas similar to those in the cervical glands. There were also three small, opaque glands which were diffusely caseous. A few tubercle bacilli were seen. General tuberculosis was produced in two guinea-pigs and slight tuberculosis in a rabbit killed 93 days after intraperitoneal inoculation.

Spleen.—No tubercles were visible, but general tuberculosis was produced in two guinea-pigs inoculated with the antiforminised tissue.

Kidneys.—In the pyramids of each, mainly at the apices, were caseous masses beginning to soften, the largest measuring 1 × 1·2 cm. Tubercle bacilli were very abundant and massed together.

Intestine.—One Peyer's patch showed a tuberculous ulcer.

Summary.

Cultures were obtained directly from the cervical and mesenteric glands and the antiforminised lung; also from the lung through a rabbit. They were all eugonic. Tested on rabbits, the mesenteric gland and lung cultures were of low virulence. Evidence as to portal of entry inconclusive.

H 4.

E. A. M., $2\frac{2}{3}$ years; male.—Phthisis; general tuberculosis. Von Pirquet reaction reported slightly positive to bovine tuberculin.

Cervical Glands.—One gland, 1·3 × 1 × ·7 cm., was found on section to be three-fourths caseous and softening in the centre. A second gland, about the same size, contained a firm caseous nodule. A few tubercle bacilli, long and beaded, were found. General tuberculosis was produced in two guinea-pigs.

Bronchial Glands.—On the left side several glands were enlarged, caseous throughout, and softening, the largest measuring 2 × 1 × 1·3 cm. On the right side the glands were also considerably enlarged, but less extensively caseous. A few very long tubercle bacilli were seen. General tuberculosis was produced in two guinea-pigs.

Lungs.—Contained numerous irregular, caseous nodules, forming in parts caseous areas measuring up to 1 cm. in diameter. A few of the largest were softening and becoming caseo-purulent.

Mesenteric Glands.—There were 10 enlarged glands, the largest measuring 1·4 × ·9 × ·7 cm.; they were almost entirely replaced by firm, yellow caseous substance; in one there was slight softening. A few long and rather degenerate tubercle bacilli were seen. General tuberculosis was produced in two guinea-pigs.

Spleen.—Measured 7·3 × 4·5 × 2 cm. One tubercle was visible beneath the capsule. The substance was firm, and scattered throughout were fairly numerous, distinctly palpable, greyish nodules, the majority about the size of millet seeds, with irregular, yellowish, caseous centres.

Kidneys.—Several firm, yellowish, caseous tubercles, the size of millet seed, were visible beneath the capsules; in section the pyramids were normal.

Intestines.—Two caseous nodules in wall of small intestine.

Summary.

Direct cultures from cervical, bronchial, and mesenteric glands were all eugonic. Tested on rabbits, the bronchial and mesenteric gland cultures were of low virulence. Evidence as to portal of entry inconclusive.

H 6.

V. K., 7 years; female.—Tuberculous pneumonia; general tuberculosis; meningitis. History of measles and whooping cough.

Cervical Glands.—Many enlarged, the largest measuring 1·5 × 1·5 × ·6 cm., and containing large, irregular, caseous areas in which a few tubercle bacilli were seen. General tuberculosis was produced in a guinea-pig.

Bronchial Glands.—Extensively enlarged and caseous. At the root of the right lung was a mass of tuberculous glands measuring 3 × 2 × 1·8 cm. A few tubercle bacilli were seen in each of three. General tuberculosis was produced in two guinea-pigs.

Lungs.—Closely filled with caseous, miliary tubercles. In the left apex was a triangular area, 5 cm. on each side, which contained large ragged cavities filled with caseo-purulent material. The right apex was similarly but less extensively affected; the remaining parenchyma contained numerous small cavities filled with caseo-pus, in which tubercle bacilli were numerous.

Mesenteric Glands.—Many were moderately enlarged, and a considerable proportion of these contained one or more firm, yellow, caseous, discrete patches, in which tubercle bacilli were scanty. General tuberculosis was produced in a guinea-pig.

Spleen.—A moderate number of minute, translucent tubercles; also caseous tubercles up to a millet seed.

Kidneys.—On section each contained in the cortex and in the pyramids scattered caseous nodules up to 3 mm. in diameter.

Intestines.—In the small intestine were seven caseous nodules up to a small pea in size. Tubercles and deposit of lymph reported on meninges.

Summary.

Cultures obtained directly from the cervical, bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 8.

A. P., 2⅓ years; male.—Diarrhœa; convulsions.

Cervical Glands.—Enlarged, and many caseous throughout, the largest measuring 1 × 1·2 × ·8 cm. The caseous tissue was firm, partially softening in the largest, and surrounded by fibrous

tissue, to which it was adherent. Tubercle bacilli were moderately numerous, some degenerate, and many rather thick, curved, and irregularly stained. An emulsion failed to produce tuberculosis in two guinea-pigs in six weeks and in a rabbit, inoculated intraperitoneally, in 62 days.

Bronchial Glands.—Slightly enlarged, but no visible tuberculosis. Three guinea-pigs were killed six weeks after inoculation; two were healthy; in the third there was general tuberculosis.

Lungs.—No lesions of tuberculosis.

Mesenteric Glands.—Some were slightly enlarged and each of two contained a minute caseous focus. Three guinea-pigs were found free from tuberculosis six weeks after inoculation.

Spleen.—One minute grey tubercle, containing a few long tubercle bacilli, was seen beneath the capsule; in the substance was one yellowish, caseous, miliary tubercle with a translucent capsule and soft, caseous, gritty centre; no tubercle bacilli could be seen in it. Three guinea-pigs inoculated with antiforminised emulsion of spleen tissue were found free from tuberculosis when killed six weeks afterwards.

Intestines.—No tuberculous lesions.

Summary.

Cultures made directly from a cervical gland and from an inoculated guinea-pig remained sterile; a culture from a guinea-pig inoculated with bronchial gland was eugonic and of low virulence for rabbits. Origin of infection probably alimentary.

H 11.

C. H., 5 years; male.—Typhoid fever.

Cervical Glands.—Apparently normal. General tuberculosis was produced in two guinea-pigs.

Bronchial Glands.—Apparently normal. General tuberculosis was produced in four guinea-pigs.

Mesenteric Glands.—Enlarged and congested but no visible lesions of tuberculosis. General tuberculosis was produced in three guinea-pigs.

Other Organs.—No visible lesions of tuberculosis; typical typhoid ulceration of intestine.

Summary.

Cultures, obtained through guinea-pigs, from the cervical, bronchial, and mesenteric glands were all eugonic. Tested on rabbits, the bronchial and mesenteric gland cultures were of low virulence. Evidence as to portal of entry inconclusive.

H 12.

A. H. H., 4 years; male.—Diptheria 12 months previously; death from laryngeal obstruction.

Mesenteric Glands.—Slight general enlargement; one gland about the size of a sparrow's egg contained two nodules separated by a little normal gland tissue. These nodules consisted of soft, yellowish, slightly gritty, caseous material surrounded by thick fibrous walls. They contained a moderate number of tubercle bacilli, the majority short and uniformly stained, a few fairly long and curved. Three guinea-pigs were found healthy six

weeks after inoculation, and also a rabbit killed 106 days after intravenous inoculation.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with bronchial glands were found healthy six weeks afterwards.

Summary.

Direct cultures from the mesenteric glands and cultures from each of the six guinea-pigs and the rabbit mentioned above all remained sterile. Origin of infection probably alimentary.

H 14.

J. F., 10 years; male.—Wasting and diarrhœa; history of ascites, thought to be due to tuberculous peritonitis.

Mesenteric Glands.—Apparently normal, but produced slight tuberculosis in one of three guinea-pigs inoculated, the other two remaining healthy.

Other Organs.—Entirely free from evidence of past or present tuberculosis. Extreme fatty change of liver. Three guinea-pigs inoculated with bronchial glands were found free from tuberculosis six weeks afterwards.

Summary.

A culture obtained, through a guinea-pig, from the mesenteric glands was dysgonic and of high virulence for two rabbits. Origin of infection probably alimentary.

H 16.

D. C., $6\frac{11}{12}$ years; female.—Mitral stenosis and incompetence.

Mesenteric Glands.—Six were tuberculous. These were slightly enlarged, one measuring about 1·2 by ·6 cm. They were firm and on section partly composed of yellowish and whitish caseous substance, not softening and not gritty. There was some fibrous tissue surrounding the caseous substance. Tubercle bacilli were scanty, rather short and thick and some broken up. An emulsion produced tuberculosis in a guinea-pig.

Other Organs.—No evidence of tuberculosis. Three guinea-pigs inoculated with bronchial glands and three with anti-forminised spleen were found healthy six weeks afterwards.

Summary.

A culture obtained from the mesenteric glands through a guinea-pig was dysgonic and of high virulence for two rabbits. Origin of infection probably alimentary.

H 17.

L. G., 4 years.; female. Diarrhœa, vomiting and abdominal pain for six months; dulness to percussion and harsh breath sounds over upper lobe of left lung.

Cervical Glands.—Composed practically throughout of firm, opaque, yellowish, caseous tissue, the largest measuring 2·7 by 1·6 by 1·2 cm. A few tubercle bacilli were seen.

Bronchial Glands.—Much enlarged; consisted of firm, yellowish, caseous substance in a matrix of translucent tissue, with the exception of some which were caseous throughout. No tubercle

bacilli could be found in two smears. General tuberculosis was produced in three guinea-pigs.

Lungs.—Report received:—"The pleura was everywhere covered with tubercles and there were small patches, some showing early caseation, throughout both lungs. Very tough pleural adhesions were present at the apices of both lungs and both apices were the seat of large caseating masses."

Mesenteric Glands.—Formed a mass, 9 × 7 × 2·5 cm., consisting of large adherent glands composed practically throughout of firm, opaque, yellowish white, caseous tissue. No tubercle bacilli were found in three smears. General tuberculosis was produced in three guinea-pigs.

Other Organs.—Report received:—"The peritoneum was everywhere studded with small tubercles. Tuberculous ulcers were present in the small intestines. There were a few scattered tubercles at the base of the brain and along the middle cerebral arteries."

Summary.

Direct cultures from the cervical and bronchial glands and cultures from the mesenteric gland through a guinea-pig were all eugonic. Tested on rabbits, the bronchial and mesenteric gland cultures were of low virulence. Evidence as to portal of entry inconclusive.

H 21.

G. S., 6 years; male.—Morbus cordis.

Lungs.—There was a brownish caseous nodule, about the size of a millet seed, in which no tubercle bacilli were seen.

Spleen.—On section there were two fibrous nodules, less than rape seed in size, in which no tubercle bacilli were seen. Three guinea-pigs were found healthy six weeks after inoculation.

Liver.—On the surface was a single grey, submiliary tubercle with an opaque centre. Two guinea-pigs were found healthy six weeks after inoculation.

Other organs.—No visible tuberculosis. Three guinea-pigs inoculated with bronchial glands and three inoculated with mesenteric glands were all found healthy six weeks afterwards.

Summary.

Cultures from two guinea-pigs inoculated with mesenteric glands, from one inoculated with spleen, and from one inoculated with liver tubercle all remained sterile. Origin of infection probably respiratory.

H 23.

N. D., 6½ years; female. Tuberculous meningitis; clinically, no definite physical signs in chest or abdomen.

Bronchial Glands.—At the bifurcation of the trachea these were caséating and ulcerating into the left bronchus; there was also a caseous gland just above the bifurcation. A few long beaded bacilli were seen. The glands at the roots of the lungs were not enlarged and not visibly tuberculous. General tuberculosis was produced in three guinea-pigs; two others, inoculated with anti-forminised tissue, and a rabbit remained healthy.

Lungs.—In the centre of the left lung was a caseous, softening nodule, nearly 1 cm. in diameter, within a thin fibrous capsule. A few minute translucent tubercles were found beneath the pleura on both sides.

Mesenteric Glands.—Apparently normal. Three guinea-pigs were found healthy six weeks after inoculation.

Spleen.—Tubercles visible under capsule; on section, a moderate number of minute translucent tubercles, up to a rape seed in size, were seen distributed throughout the substance. Tuberculosis was produced in three guinea-pigs.

Other Organs.—No visible tuberculosis of liver, kidneys, or intestines; brain reported typical of acute tubercular meningitis.

Summary.

A culture from the bronchial glands, through a guinea-pig was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 25.

F. P., 8 years; female.—Fracture of skull; septic meningitis.

Lungs.—Beneath the pleura were two nodules, one the size of a millet seed, the other the size of a hemp seed, composed of chalky material in a fibrous capsule. Two guinea-pigs were found healthy six weeks after inoculation with these nodules.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands, three with bronchial glands, and three with antiforminised spleen were all found healthy six weeks afterwards.

Summary.

Two guinea-pigs inoculated with lung nodules remained healthy. Origin of infection probably respiratory.

H 26.

A. S., $8\frac{1}{12}$ years; male.—Otorrhœa; hæmoptysis; general tuberculosis.

Cervical Glands.—Enlarged and contained yellow, caseous areas, in which tubercle bacilli were fairly numerous, the majority being long. General tuberculosis was produced in two guinea-pigs.

Bronchial Glands.—Moderately enlarged; caseous patches in the cortices; tubercle bacilli scanty. General tuberculosis produced in three guinea-pigs.

Lungs.—Pleurisy, with dense adhesions; miliary tuberculosis.

Mesenteric Glands.—Several were enlarged and caseous; tubercle bacilli were scanty. General tuberculosis was produced in three guinea-pigs.

Other Organs.—General tuberculosis of liver, spleen, and kidneys; two caseous areas reported in occipital regions of brain. Tubercles on pericardium.

Summary.

Direct cultures from cervical, mesenteric and bronchial glands were all eugonic; tested on rabbits, the last two were of low virulence. Evidence as to portal of entry inconclusive.

H 27.

C. F., 2¼ years; female.—Tuberculous peritonitis and general tuberculosis.

Bronchial Glands.—The majority were moderately enlarged and studded with yellow, caseous patches containing numerous tubercle bacilli. General tuberculosis was produced in three guinea-pigs.

Lungs.—Studded with numerous miliary caseating tubercles.

Mesenteric Glands.—Generally enlarged and almost entirely composed of caseous tissue, in which tubercle bacilli were numerous. General tuberculosis was produced in three guinea-pigs and a rabbit.

Spleen.—Sparsely scattered, irregular, miliary caseous tubercles.

Liver.—Pale and fatty; no tubercles visible.

Kidneys.—Cortices composed of firm, greyish white tissue showing sparsely scattered, submiliary, caseous tubercles.

Intestines.—Densely adherent and covered in parts with a caseous membrane.

Other Organs.—Caseous nodules on the pericardium, containing numerous tubercle bacilli.

Summary.

Direct cultures from the bronchial and mesenteric glands and from a pericardial nodule, and a culture from the mesenteric glands through a rabbit were all dysgonic; the three first cultures were tested on rabbits and were found to be of high virulence. Origin of infection probably alimentary.

H 28.

H. P., 3 years; female.—General tuberculosis; meningitis. Mother phthisical.

Cervical Glands.—Contained caseous patches.

Bronchial Glands.—Greatly enlarged and caseous throughout; tubercle bacilli scanty. General tuberculosis was produced in three guinea-pigs.

Lungs.—Reported to be studded with tubercles.

Mesenteric Glands.—Seven or eight glands were enlarged to a moderate extent, the largest being about 8 mm. in diameter, and containing firm, yellow, caseous patches; tubercle bacilli scanty. General tuberculosis was produced in three guinea-pigs.

Spleen.—A few caseous, miliary tubercles.

Liver.—Reported to be studded with tubercles.

Kidneys.—A few scattered tubercles.

Intestines.—No tuberculous lesions found.

Other Organs.—A few tubercles reported on the endocardium of right ventricle of heart, and advanced tuberculous meningitis with internal and external hydrocephalus.

Summary.

Direct cultures from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 29.

A. S. C., 6 years; male.—Gangrenous appendicitis; general peritonitis.

Lungs.—Just beneath the pleura were two small palpable nodules, darkly pigmented, which on section were found caseous and gritty. The two guinea-pigs inoculated with them were found healthy six weeks afterwards.

Mesenteric Glands.—Moderately enlarged but not visibly tuberculous. Three guinea-pigs were found free from tuberculosis six weeks afterwards.

Other Organs.—No evidence of tuberculosis. The three guinea-pigs inoculated with bronchial glands were found healthy six weeks afterwards.

Summary.

Two guinea-pigs inoculated with lung nodules remained healthy. Origin of infection probably respiratory.

H 32.

D. G., 6½ years; female.—Rheumatic fever; morbus cordis; pyaemia.

Bronchial Glands.—Enlarged; no caseation, but in several were quite translucent foci in the cortices. One tubercle bacillus, long and beaded, was seen. Three guinea-pigs developed general tuberculosis.

Lungs.—A few caseous tubercles in right lung and two scars containing (1) a caseo-calcareous nodule, and (2) some caseo-purulent substance. No tubercle bacilli were seen in either. (1) produced tuberculosis in two guinea-pigs; (2) failed to do so.

Other Organs.—No evidence of tuberculosis. Two guinea-pigs inoculated with mesenteric glands were found healthy six weeks afterwards.

Summary.

A culture obtained from the bronchial glands, through a guinea-pig, and a culture obtained directly from the human lung were eugonic; tested on rabbits, the culture from the bronchial gland was of low virulence. Origin of infection probably respiratory.

H 33.

J. B., 10 years; male.—Acute nephritis.

Bronchial Glands.—On the left side two showed caseous, gritty patches; a gland within the bifurcation was partly caseous; on the right side, above the root of the lung, was a chain of 4 pigmented glands, the largest measuring 1·3 × 1 × 1 cm., entirely composed of caseous chalky substance in parts gritty. Three guinea-pigs were killed six weeks after inoculation; two showed slight tuberculosis; the third was healthy.

Lungs.—In the left upper, the right upper, and the right lower lobes were grey nodules with caseous centres. They contained numerous tubercle bacilli, many in small masses, some long and rather degenerate looking. Two guinea-pigs were inoculated but were found free from tuberculosis six weeks afterwards.

Spleen.—On section three tubercles were found, with grey translucent capsules and soft caseous centres varying up to a mustard seed in size.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands were found healthy when killed six weeks afterwards.

Summary.

Direct cultures from the lung nodules remained sterile; a culture from the bronchial glands, through a guinea-pig was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 34.

W. M., 3 years; male.—General tuberculosis; meningitis.

Bronchial Glands.—Two glands at the root of the right lung were moderately enlarged and caseous throughout; on the same side above the root was a mass of adherent glands, 2 × 1·7 × 1 cm., almost entirely composed of caseous tissue, partly firm and partly softening. A gland within the bifurcation contained a fibro-caseous patch. The left bronchial glands were only slightly enlarged, one alone showing two caseous tubercles. Tubercle bacilli were moderately numerous. General tuberculosis was produced in three guinea-pigs.

Lungs.—There were scattered dark, congested, oedematous areas, which collapsed on section, allowing escape of gas and blood-stained fluid. In the upper lobe of the right lung, just beneath the pleura, was a caseous area about ½ cm. in diameter, surrounded by a little crop of small, translucent tubercles. Scattered throughout the rest of the substance of both lungs was a moderate number of small, grey, submiliary tubercles, a few of the largest of which showed slight central caseation. Tubercle bacilli were numerous.

Mesenteric Glands.—Not enlarged; in five were one or two caseating submiliary tubercles. General tuberculosis was produced in three guinea-pigs.

Spleen.—Moderately numerous translucent, submiliary tubercles, of which only the largest showed central caseation.

Other Organs.—Tubercles reported in meninges of brain; no tubercles in liver, kidneys, and intestine.

Summary.

Direct cultures from bronchial glands and lungs and cultures from mesenteric glands through a guinea-pig were eugonic; tested on rabbits, the bronchial and mesenteric gland cultures were of low virulence. Origin of infection probably respiratory.

H 36.

R. B., 4 years; female.—Diarrhœa and vomiting; pericarditis.

Bronchial Glands.—On the left side, above the root of the lung, were two glands, about ·6 cm. in diameter, composed of dry, putty-like, caseous substance contained within a thick fibrous wall. Two tubercle bacilli were seen. Three guinea-pigs were inoculated but were found healthy when killed in six weeks.

Lungs.—On the left side, in the margin of the upper lobe, was an oval nodule, 1 × ·7 × ·5 cm., composed of firm caseous substance surrounded by a thick fibrous capsule. No tubercle bacilli were seen.

Other Organs.—No visible tuberculosis. The mensenteric glands were uniformly enlarged; three guinea-pigs were found healthy when killed six weeks after inoculation.

Summary.

Direct cultures from the bronchial glands and lung nodule remained sterile; the three guinea-pigs inoculated with bronchial and mesenteric glands remained healthy. Origin of infection probably respiratory.

H 37.

M. J., 2½ years; female.—Abdominal tuberculosis and tuberculous broncho-pneumonia.

Bronchial Glands.—A small gland at the root of the left lung showed a few caseous foci; a larger pigmented gland above the root contained a softening caseous nodule, ·8 cm. in diameter, surrounded by a fibrous capsule; an adjacent gland contained two caseous tubercles. Tubercle bacilli were scanty. The remaining bronchial glands showed no obvious lesions. General tuberculosis was produced in two guinea-pigs.

Lungs.—Both lungs contained moderately numerous discrete tubercles and nodules up to ·5 cm. in diameter.

Mesenteric Glands.—Enlarged and adherent, consisting of yellow, softening, caseous substance surrounded by translucent fibrous tissue. Tubercle bacilli were scanty. General tuberculosis was produced in three guinea-pigs.

Kidneys.—No tubercles found.

Intestines.—The peritoneal covering was beset with numerous translucent tubercles, a few with central caseation. In the wall of the small intestine a few small, caseous nodules were seen.

Summary.

Cultures from the mesenteric glands (through a guinea-pig) and from the bronchial glands (direct) were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 38.

H. G. S., 9 years; male.—Hip disease; tuberculous pneumonia.

Bronchial Glands.—The majority were moderately enlarged and studded with firm yellow, caseous patches, softening in parts; some of the glands were almost wholly replaced by caseous material. Tubercle bacilli moderately numerous; staining irregular, no very long forms. General tuberculosis produced in two guinea-pigs.

Lungs.—The substance of both lungs contained numerous tubercles, the majority minute and translucent, the largest entirely caseous and nearly the size of hemp seed. At the apex of the right lung there was a solid area, about ·6 cm. in diameter, containing a caseous patch and several caseous nodules.

Mesenteric Glands.—Two glands, enlarged to about 1 cm. in diameter, were caseous throughout. Two smaller glands showed, in one, a caseous tubercle and, in the other, small caseous patches. Remaining glands small and apparently normal. Tubercle bacilli scanty in the affected glands, moderate in length and uniformerly stained. General tuberculosis produced in three guinea-pigs.

Spleen.—Enlarged and closely filled with minute, translucent tubercles and caseous nodules, the largest 1·3 × ·6 cm. in area, the majority ranging between a hemp seed and a small pea. In many the caseous substance was softening. Tubercle bacilli were scanty and irregular in shape.

Kidneys.—Contained sparsely scattered, somewhat indefinite, translucent grey foci, in which no tubercle bacilli were seen.

Intestines.—No tuberculous lesions.

Summary.

Direct bronchial gland cultures and cultures from the mesenteric glands through a guinea-pig were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 39.

C. C., 3 years; female.—Tuberculous meningitis.

Bronchial Glands.—Within the bifurcation a gland contained a single caseous, encapsuled nodule a little larger than a hemp seed. On the left side a gland, not enlarged, contained a minute soft, caseous tubercle, not appreciably gritty; embedded in the root of the left lung was a gland the size of a pea consisting throughout of caseous substance, and a third very small pigmented gland contained two caseous foci. Tubercle bacilli were fairly numerous. Three guinea-pigs were killed six weeks after inoculation; there was slight tuberculosis in one but none in the other two.

Lungs.—There was a patch of caseous gritty tubercles, up to a millet seed in size, in the upper left lobe. The rest of the lungs showed no tubercles.

Mesenteric Glands.—Four glands, slightly enlarged, each contained a single tubercle, yellow, soft and caseous and in one case gritty, ranging in size from a rape seed to a hemp seed. No tubercle bacilli were seen. General tuberculosis was produced in three guinea-pigs.

Other Organs.—No tuberculosis of intestines; basal meningitis of brain and some thickening of pia mater along the longitudinal fissure, but no definite tubercles visible.

Summary.

Cultures, through guinea-pigs, from bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 40.

E. M., 9 years; male.—Chronic enteritis; von Pirquet and Widal reactions negative.

Bronchial Glands.—At the root of the right lung were four glands, moderately enlarged, which contained patches of greyish, soft, caseo-purulent substance surrounded by fibrous tissue, and containing moderate numbers of tubercle bacilli. The other glands were normal. General tuberculosis was produced in three guinea-pigs.

Lungs.—At the upper extremity of the right lung was evidence of old pleurisy. The upper and middle lobes were adherent; there was a fibrous thickening on the dorsal surface, and fibrosis around the root of the lung. Beneath the fibrous layer on the posterior surface of the upper lobe were two nodules and a small fibro-caseous patch; one of the nodules was caseous and gritty and was contained within a fibrous capsule, the other was soft and greyish yellow in the centre. In each of the three nodules one or two tubercle bacilli were found, all of which looked degenerate. No tuberculosis elsewhere. The nodules produced general tuberculosis in three guinea-pigs.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands were found healthy when killed six weeks afterwards.

Summary.

Cultures from the bronchial glands and lungs through guinea-pigs were eugonic; tested on rabbits, a culture from the former was of low virulence. Origin of infection probably respiratory.

H 41.

R. W., 3 years; female.—Tuberculous mesenteric glands; tuberculous meningitis.

Bronchial Glands.—Apparently normal, but produced general tuberculosis in three guinea-pigs.

Lungs.—A few minute translucent tubercles were visible beneath the pleura; a smear from one showed no tubercle bacilli.

Mesenteric Glands.—About eight were enlarged, the largest measuring 1·6 × 1·1 × ·9 cm.; they were either completely or partially replaced by firm, yellow, caseous patches. Tubercle bacilli were moderately numerous and short. General tuberculosis was produced in three guinea-pigs.

Spleen.—Moderately numerous miliary tubercles.

Intestine.—Two ulcers reported at extreme lower end of ileum.

Other Organs.—Reported normal, with exception of brain, which showed advanced tuberculous meningitis.

Summary.

Direct cultures from the mesenteric glands and cultures from the bronchial glands through a guinea-pig were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 42.

R. M., 3 years; female.—Street accident; ruptured liver; large thymus.

Lungs.—In the margin of the right lower lobe were two nodules, one the size of a millet seed, the other rather smaller. They were composed of yellowish white, gritty substance. In smears no tubercle bacilli were seen. Two guinea-pigs were found healthy when killed six weeks after inoculation.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands and two with bronchial glands were found healthy when killed six weeks afterwards.

Summary.

No tubercle bacilli obtainable. Origin of infection probably respiratory.

H 43.

F. O. D., 4 years; female.—Tuberculous pneumonia; history of measles and whooping cough.

Bronchial Glands.—Enlarged and caseous throughout, the two largest measuring 2·2 × 1·1 × 1 cm. Tubercle bacilli were scanty, long, and beaded. General tuberculosis was produced in three guinea-pigs.

Lungs.—Caseous nodules were scattered throughout both lungs, the largest measuring about 1·5 × 1 cm. At the left apex was a cavity, about 2 × 1·5 cm. on section.

Mesenteric Glands.—Not enlarged. One contained a caseous tubercle, about 2 mm. in diameter, in which a few long and beaded tubercle bacilli were seen. An emulsion, containing this nodule, was inoculated into two guinea-pigs, which were found healthy when killed six weeks afterwards.

Other Organs.—Reported normal, with the exception of the kidneys, in which a few tubercles were seen.

Summary.

A culture from the bronchial glands through a guinea-pig was eugonic and of low virulence for a rabbit. Origin of infection probably respiratory.

H 44.

L. M. D., 10 years; female.—Mitral disease and adherent pericardium.

Bronchial Glands.—Within the root of the left lung was a very small gland which contained a soft, caseous, gritty nodule within a fibrous capsule. Above this was a moderately enlarged gland containing a caseo-calcareous nodule. On the right side, just within the root, a gland contained about seven tubercles up to 2 mm. in diameter and of similar structure to the above. Smears from each of these three glands showed a few tubercle bacilli. The three guinea-pigs which were inoculated with them were found healthy when killed six weeks afterwards.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands were found healthy when killed six weeks afterwards.

Summary.

Cultures made directly from the bronchial glands remained sterile and each of the three guinea-pigs inoculated remained healthy. Origin of infection probably respiratory.

H 46.

G. H., 10 years; male.—General tuberculosis.

Bronchial Glands.—Somewhat enlarged, and some contained a few caseous patches. General tuberculosis was produced in three guinea-pigs.

Lungs.—Reported miliary tuberculosis of both.

Mesenteric Glands.—Moderately enlarged and contained yellowish, firm, caseous patches. Tubercle bacilli were fairly numerous, long and beaded. General tuberculosis was produced in three guinea-pigs.

Other Organs.—It was reported that tubercles were visible in the kidneys, liver, intestines and on the peritoneum, but not in the spleen.

Summary.

Cultures obtained direct from the mesenteric glands and from the bronchial glands through a guinea-pig were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 47.

J. B., $2\frac{3}{4}$ years; male.—Tuberculous peritonitis and meningitis. Tuberculous history on mother's side. Von Pirquet reaction negative.

Bronchial Glands.—Not enlarged nor visibly tuberculous but produced general tuberculosis in three guinea-pigs.

Lungs.—Moderately numerous tubercles, grey, with opaque centres and sharply defined congested margins, up to 1 mm. in diameter.

Mesenteric Glands.—The great majority were enlarged, the largest measuring 2·5 × 2 × ·8 cm.; some contained firm caseous patches, others were practically replaced by caseous substance. Tubercle bacilli were numerous and short. General tuberculosis was produced in three guinea-pigs.

Intestines.—In the ileum were 20 ulcers, the largest and most numerous being near the ileo-colic valve; the area of the largest was 1·6 × 1 cm.; the margins were thickened and the floor congested. The wall of the caecum was thickened by caseous infiltration, and the mucous membrane was very extensively ulcerated. Tubercle bacilli were numerous. The appendix was thickened and contained very numerous tubercle bacilli of medium length. The mucous membrane of the colon was covered with serpiginous ulcers with brightly congested margins. The base of the ulcers was thin, being formed by peritoneum only; on the peritoneal side were collections of minute tubercles.

Other Organs.—The disease was reported to be generalised.

Summary.

Direct cultures from the mesenteric glands and cultures from the bronchial glands through a guinea-pig were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 48.

C. W., $2\frac{11}{12}$ years; male. Pulmonary tuberculosis. Von Pirquet reaction "weakly positive." History of measles and whooping cough.

Bronchial Glands.—Greatly enlarged, up to a pigeon's egg, and almost wholly caseous. Fairly numerous long tubercle bacilli. General tuberculosis was produced in three guinea-pigs.

Lungs.—Both closely filled with grey nodules with caseous centres, up to a hemp seed in size and confluent in parts.

Mesenteric Glands.—Slight general enlargement. A moderate number showed in the cortices early caseous patches containing a moderate number of tubercle bacilli. General tuberculosis was produced in three guinea-pigs.

Spleen.—Numerous caseous nodules up to a pea in size and containing a few long tubercle bacilli.

Intestines.—No ulceration.

Summary.

Direct mesenteric and bronchial gland cultures were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 49.

F. H., 7 years; male.—Street accident.

Bronchial Glands.—On the right side, above the bronchus, a gland contained a yellow, caseous nodule the size of a wheat grain. No tubercle bacilli were seen in it. Three guinea-pigs, two inoculated with this nodule, and a third with apparently normal tissue, were found healthy when killed six weeks afterwards.

Lungs.—The two left lobes were adherent and between them was a caseo-calcareous, hemp-seed sized nodule surrounded by a pigmented fibrous capsule. At the apex of the right lung was a small collection of fibrous, translucent tubercles, and near these a caseo-calcareous granule. Between the upper and middle lobes, which were adherent, was a caseous, gritty nodule surrounded by scar tissue. At the base of the right lung there was a fibrous adhesion between the pleura and pericardium containing a caseous gritty nodule the size of a wheat grain. In three of the above nodules a few tubercle bacilli were found, but the three guinea-pigs inoculated with them were found healthy when killed six weeks afterwards.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands were found free from tuberculosis when killed six weeks afterwards.

Summary.

Direct cultures from bronchial gland and lung nodules remained sterile and two guinea-pigs inoculated with bronchial nodules remained healthy. Origin of infection probably respiratory.

H 50.

M. S., 8 years; male.—Morbus cordis.

Bronchial Glands.—No visible tuberculosis. Three guinea-pigs were found healthy when killed six weeks after inoculation.

Mesenteric Glands.—Apparently normal but produced general tuberculosis in three guinea-pigs.

Other Organs.—No visible tuberculosis.

Summary.

Cultures from a guinea-pig inoculated with mesenteric glands were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 53.

A. W., 7 years; male.—Congenital dilatation of colon; operation, peritonitis.

Bronchial Glands.—At the root of the left lung a gland contained a caseo-calcareous, pea-sized nodule. The gland within the bifurcation was fibrotic but showed no caseation. A few tubercle bacilli were found in the nodule. One out of four guinea-pigs inoculated developed general tuberculosis, the others being found free from tuberculosis.

Lungs.—In the left lower lobe, just beneath the pleura, was a pea-sized nodule consisting of a fibrous wall containing a caseo-calcareous grain. No tubercle bacilli were seen in it; it failed to produce tuberculosis in two guinea-pigs.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands were found free from tuberculosis when killed six weeks afterwards.

Summary.

A culture from the bronchial glands through a guinea-pig was eugonic and of low virulence for a rabbit. Origin of infection probably respiratory.

H 56.

I. C., $3\frac{7}{12}$ years; female.—Miliary tuberculosis; pneumonia; pneumothorax.

Bronchial Glands.—Greatly enlarged and completely caseous. Tubercle bacilli moderately numerous, long and beaded. General tuberculosis produced in two guinea-pigs.

Lungs.—Reported solid with miliary tubercles.

Mesenteric Glands.—Some were enlarged and many soft and caseous. Tubercle bacilli very numerous, long and beaded. General tuberculosis produced in two guinea-pigs.

Other Organs.—It was reported that the spleen and liver were studded with tubercles and there were a few tubercles in the kidneys but the brain was not affected.

Summary.

Direct cultures from mesenteric and bronchial glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 57.

A. E. W., 4½ years; male.—Fractured base of skull.

Bronchial Glands.—No visible tuberculosis. Three guinea-pigs were found healthy when killed six weeks after inoculation.

Mesenteric Glands.—There was a small mass, the size of a partridge's egg, composed of two or three adherent glands and consisting of caseous substance, slightly gritty, encapsuled and easily shelling out. Moderate numbers of short tubercle bacilli were seen. Three guinea-pigs were found healthy when killed six weeks after inoculation.

Other Organs.—No visible tuberculosis.

Summary.

Direct cultures from the mesenteric glands remained sterile, and three guinea-pigs inoculated with these glands remained healthy. Origin of infection probably alimentary.

H 59.

W. H., 5⅔ years; male.—Generalised tuberculosis. History of measles.

Cervical Glands.—Considerably enlarged; small, ill-defined caseous tubercles in the cortices.

Bronchial Glands.—Much enlarged and caseous; tubercle bacilli scanty. General tuberculosis produced in two guinea-pigs.

Lungs.—Studded with miliary tubercles.

Mesenteric Glands.—Enlarged and adherent, forming a mass which was yellow and caseous throughout and softening in parts; tubercle bacilli moderately numerous. General tuberculosis produced in two guinea-pigs.

Spleen.—Closely filled with yellow caseous nodules, up to a wheat grain in size.

Other Organs.—Scattered tubercles were reported in kidneys and liver, early tuberculous meningitis of brain; very early miliary tubercles in intestines, without ulceration.

Summary.

Direct bronchial and mesenteric gland cultures were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 60.

H. W. B., 6 years; female.—Double infantile hemiplegia; imbecile; death from inanition through difficulty of feeding and swallowing. Von Pirquet reaction positive but no definite symptoms of tuberculosis made out during life.

Bronchial Glands.—Normal on the right side. On the left side and within the bifurcation they were all enlarged and composed of yellow, softening, caseous substance. Several glands

adjacent to the trachea also contained caseous tubercles. Tubercle bacilli were moderately numerous. General tuberculosis was produced in two guinea-pigs.

Lungs.—At the base of the left lobe was a solid, reddish grey area, 4 × 3 × 1 cm., studded with softening caseous nodules. In the same lobe, near the root, was a similar, rather smaller area, and also two small nodules. The rest of the lungs was normal.

Mesenteric Glands.—Only slightly enlarged; many contained single caseous tubercles and small patches, and one small gland was caseous throughout. General tuberculosis was produced in two guinea-pigs.

Spleen.—A single minute, caseous tubercle was found on section, in which no tubercle bacilli were seen.

Kidneys.—An occasional minute translucent focus in the cortices.

Intestines.—The Peyer's patches contained caseous areas and tubercles, the mucous membrane over which was thinned and ulcerating.

Summary.

Direct cultures from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 62.

K. T., $5\frac{1}{6}$ years; female.—Generalised tuberculosis.

Bronchial Glands.—Much enlarged, especially at root of left lung, and caseous on section; tubercle bacilli moderately numerous, fairly long and somewhat broken up. General tuberculosis produced in two guinea-pigs.

Lungs.—Miliary tubercles scattered throughout both and at base of left lung a caseous area the size of a hazel nut. There were also some patches of non-tuberculous consolidation in both lungs.

Mesenteric Glands.—No visible tuberculosis, but general tuberculosis was produced in three guinea-pigs.

Spleen.—A few small tubercles.

Kidneys.—A few small tubercles.

Intestines.—No ulceration.

Other Organs.—Liver reported not tuberculous; miliary tuberculosis of meninges of brain.

Summary.

A direct culture from the bronchial glands and a culture from the mesenteric glands through a guinea-pig were both eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 68.

M. M., 6 years; female.—Idiot; hydrocephalus; congenital syphilis; rickets; extreme emaciation.

Mesenteric Glands.—A few were somewhat enlarged. One, 3 × 2 cm. in its longest diameters, was two-thirds replaced by caseous, putty-like material. Three other glands each showed one minute caseous focus. Tubercle bacilli were found in

moderate numbers and were rather short, no beaded forms being seen. Two guinea-pigs were inoculated but were found healthy when killed six weeks afterwards.

Other Organs.—No visible tuberculosis. Three guinea-pigs were found healthy when killed six weeks after inoculation with bronchial glands.

Summary.

A direct culture from the mesenteric glands remained sterile and each of the guinea-pigs inoculated with mesenteric glands remained healthy. Origin of infection probably alimentary.

H 70.

J. C., 5 years; male. Abdominal and generalised tuberculosis.

Bronchial Glands.—Slight enlargement; the largest contained numerous caseous foci; in the smaller glands these foci were sparse and discrete. Tubercle bacilli were scanty. General tuberculosis was produced in three guinea-pigs.

Lungs.—Scattered throughout the right lung were fairly numerous discrete, caseous tubercles and several firm caseous patches. At the base of the left lung was old pleurisy; the upper lobe was crepitant but contained firm caseous nodules up to a pea in size; the lower lobe was partially solidified and infiltrated with diffuse yellowish necrotic tissue in which abundant diplococci but no tubercle bacilli were seen.

Mesenteric Glands.—Much enlarged and coherent, forming a mass, 8 × 7 × 3 cm., composed almost entirely of dense caseous tissue with a few patches of firm translucent tissue. Tubercle bacilli numerous; many beaded.

Spleen.—Numerous tubercles, ranging from an opaque focus up to a firm yellow nodule the size of a millet seed.

Other Organs.—Miliary tubercles reported in liver and spleen; brain typical of tuberculous meningitis; four caseous ulcers in the ileum and one in the caecum.

Summary.

Direct cultures from the mesenteric glands and cultures from the bronchial glands through a guinea-pig were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 71.

E. M. M., 6 years; female. Tuberculous meningitis.

Cervical Glands.—Enlarged but not tuberculous.

Bronchial Glands.—Normal on the right side. At the root of the left lung and along the trachea they were moderately enlarged, firm, and composed to a large extent of fibro-caseous substance. The gland at the bifurcation was firm, fibrous, and infiltrated with caseous patches and foci. Tubercle bacilli were fairly numerous, long and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—Right lung normal. At the root of the left lung was a caseous nodule, about the size of a pea, surrounded by fibrous tissue, from which it easily shelled out.

Mesenteric Glands.—Normal; failed to produce tuberculosis in three guinea-pigs.

Spleen.—No tubercles visible.

Intestines.—Normal.

Other Organs.—Liver and kidneys reported free from tubercles; miliary tubercles on meninges of brain.

Summary.

Cultures from the bronchial glands through a guinea-pig were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 72.

E. P., 5 years; female. Broncho-pneumonia.

Mesenteric Glands.—Not enlarged. In each of four was a single yellow, caseous, encapsuled nodule about the size of a hemp seed. A few short tubercle bacilli were seen in two of these. Three guinea-pigs were found free from tuberculosis when killed six weeks after inoculation.

Other Organs.—No visible tuberculosis. Lungs typical of non-tuberculous broncho-pneumonia. Three guinea-pigs inoculated with bronchial glands were found healthy when killed six weeks afterwards.

Summary.

Cultures from the mesenteric glands remained sterile, and two guinea-pigs inoculated with the tissue remained healthy. Origin of infection probably alimentary.

H 75.

H. T., 3½ years; male. Miliary tuberculosis of lungs.

Bronchial Glands.—Enlarged, extensively caseous and softening; tubercle bacilli rather scanty, long and beaded. General tuberculosis produced in three guinea-pigs.

Lungs.—Both solid and packed with miliary tubercles.

Mesenteric Glands.—A few were enlarged and the majority contained one or more discrete, caseous tubercles, up to 3 mm. in diameter; tubercle bacilli in moderate numbers, long and beaded. General tuberculosis produced in three guinea-pigs.

Spleen.—Enlarged and packed with discrete tubercles up to 3 mm. in diameter.

Kidneys.—Scattered tubercles in cortices.

Intestines.—No ulceration.

Summary.

Direct cultures from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 76.

G. C., 4 years; male. Anæmia.

Bronchial Glands.—Apparently normal, but general tuberculosis was produced in three guinea-pigs.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with mesenteric glands were found healthy when killed six weeks afterwards.

Summary.

Cultures from the bronchial glands, through a guinea-pig, were dysgonic and of high virulence for rabbits. Origin of infection probably respiratory.

H 78.

N. H., 3¼ years; female. General tuberculosis.

Cervical Glands.—Enlarged and caseous, with much fibroid change.

Bronchial Glands.—The gland at the bifurcation was greatly enlarged and fibro-caseous; an adjacent gland was filled with soft caseous material. The glands at the roots of each lung were somewhat enlarged and partially caseous. Tubercle bacilli were scanty in one of the firm glands, but very abundant in the gland which was softening; the bacilli were moderately long but not conspicuously beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—Filled with miliary tubercles.

Mesenteric Glands.—All tuberculous. Many enlarged and showing fibroid change, interspersed with soft caseous substance. Tubercle bacilli scanty. General tuberculosis was produced in two guinea-pigs.

Intestines.—Tuberculous ulceration.

Other Organs.—General dissemination of tubercles reported in other organs, including basal meningitis.

Summary.

Direct cultures from the mesenteric and bronchial glands were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 79.

T. C., 9 years; male. Meningitis, diagnosed as tuberculous. Father died of phthisis.

Bronchial Glands.—Not visibly tuberculous, but general tuberculosis was produced in one of two guinea-pigs inoculated, the other remaining healthy.

Lungs.—At the left apex was a small triangular area containing a few fibroid translucent tubercles, some of which were yellowish and opaque in the centre; one tubercle bacillus was seen in a smear. Tuberculosis was produced in three guinea-pigs.

Other Organs.—No visible tuberculosis. Three guinea-pigs were found healthy when killed six weeks after inoculation with mesenteric glands.

Summary.

Cultures, through guinea-pigs, from the bronchial glands and lungs were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 81.

E. G., 4 years; female. Measles and whooping cough followed by pulmonary tuberculosis and empyæma.

Cervical Glands.—Enlarged and beset with small caseous areas.

Bronchial Glands.—Enlarged and showed chronic fibro-caseous areas; tubercle bacilli were moderately numerous. General tuberculosis was produced in three guinea-pigs.

Lungs.—The left lung was solid and riddled with caseo-necrotic nodules, many softening and becoming purulent; cavities were seen in early and later stages of formation. The right lung was less severely affected; caseo-necrotic nodules and tubercles were distributed throughout. Caseo-pus from the left lung was swarming with masses of tubercle bacilli.

Mesenteric Glands.—Slight enlargement; many showed discrete, grey and caseous tubercles. Tubercle bacilli were scanty. General tuberculosis was produced in three guinea-pigs.

Spleen.—Numerous minute grey tubercles seen under capsules and on section.

Kidneys.—A few tubercles in cortices and medulla.

Intestines.—Peyer's patches congested; tuberculous ulcers seen in two.

Summary.

Cultures, through guinea-pigs, of mesenteric and bronchial glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 83.

C. H., 2¼ years; female. Tuberculous knee-joints; operation; tuberculous meningitis.

Bronchial Glands.—At the root of the right lung and within the bifurcation were three moderately enlarged glands consisting almost entirely of caseo-calcareous material. The left glands were not affected. In the caseous material a few rather degenerate tubercle bacilli were seen. General tuberculosis was produced in one guinea-pig, the other two guinea-pigs inoculated being found free from tuberculosis.

Lungs.—At the junction of the right upper and middle lobes was a pea-sized nodule with a firm fibrous capsule and a caseo-calcareous centre. Scattered throughout both lungs were moderately numerous minute, translucent tubercles. Two guinea-pigs inoculated with the nodule, which showed moderately numerous tubercle bacilli, were found free from tuberculosis when killed six weeks afterwards, and a culture made from one remained sterile.

Mesenteric Glands.—Slightly enlarged; no visible tuberculosis, but tuberculosis was produced in two out of three guinea-pigs inoculated.

Other Organs.—No visible tubercles in spleen, kidneys, liver, and intestines.

Summary.

Cultures from the bronchial and mesenteric glands, through guinea-pigs, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 85.

J. C., 5¼ years; male. Tuberculous meningitis; family history of phthisis.

Bronchial Glands. — Three glands above the right bronchus were fibro-caseous but not appreciably enlarged; one gland below this bronchus, at the root of the lung, contained a calcareous centre. The gland at the bifurcation and the glands on the left side appeared normal. In the lesions tubercle bacilli were scanty, of moderate length, and not beaded. General tuberculosis was produced in three guinea-pigs.

Lungs.—Reported free from visible lesions.

Mesenteric Glands. — No visible lesions. Three guinea-pigs were found free from tuberculosis when killed six weeks after inoculation.

Spleen.—A few miliary tubercles were reported on the surface. Two guinea-pigs were inoculated with a portion of apparently normal antiforminised tissue and in one general tuberculosis was produced.

Kidneys.—No visible lesions.

Liver.—A few miliary tubercles were reported on the surface. Two guinea-pigs, inoculated with a portion of apparently normal antiforminised tissue, developed general tuberculosis.

Intestines.—No ulceration.

Other Organs.—The report on the brain was:—"There was an acute basal meningitis with crowds of tubercles, some of which were becoming slightly caseous."

Summary.

Cultures, through guinea-pigs, from bronchial glands, spleen, and liver were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 86.

C. U., 3 years; female. General tuberculosis.

Bronchial Glands.—The majority were greatly enlarged and wholly caseous. Tubercle bacilli were rather scanty, long and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—Both lobes were closely filled with caseous nodules, the majority miliary and in many parts confluent. In the left upper lobe, which was adherent to the lower, was a dense caseo-necrotic patch, 4 × 4 × 5 cm. Tubercle bacilli were rather scanty, long and beaded.

Mesenteric Glands.—Moderately enlarged; many showed single caseous, miliary tubercles, and a few contained several; others appeared normal. Tubercle bacilli were scanty. General tuberculosis was produced in three guinea-pigs.

Spleen.—Enlarged and closely filled with firm, yellow, confluent, caseous nodules.

Kidneys.—Fairly numerous caseating tubercles up to a millet seed.

Liver.—Similar to kidneys.

Intestines.—In the Peyer's patches were one or two caseous submiliary tubercles.

Other Organs.—Brain reported normal.

Summary.

Direct bronchial and mesenteric gland cultures were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 87.

N. F., $2\frac{5}{6}$ years; female. Suppurative middle ear disease; miliary tuberculosis; meningitis, tuberculous and septic.

Cervical Glands.—Early caseous patches in the cortices.

Bronchial Glands.—At the root of the left lung they were enlarged and caseous throughout. Caseous patches and tubercles were seen in the remaining glands. Tubercle bacilli were numerous, rather long and slender. General tuberculosis was produced in two guinea-pigs.

Lungs.—Throughout the lung substance were numerous grey, translucent tubercles without definite opacity. In the left lower lobe, on the dorsal surface beneath the pleura, was a pea-sized caseous nodule. Tubercle bacilli were numerous and of moderate length.

Mesenteric Glands.—Five showed caseous tubercles and patches, resembling the cervical glands. Tubercle bacilli were scanty, moderately long and irregularly stained. General tuberculosis was produced in three guinea-pigs.

Spleen.—In the substance and projecting slightly on the surface were numerous tubercles similar to those in the lungs.

Intestines.—No ulceration.

Other Organs.—Kidneys and liver reported free from tubercles; tuberculous meningitis of brain and secondary septic meningitis from suppurating mastoid.

Summary.

Direct mesenteric and bronchial gland cultures were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 89.

A. R. S., 6 years; female. Phthisis; history of lupus.

Bronchial Glands.—Near a small gland at the root of the lung was a scar with a miliary caseo-calcareous nodule beneath it; this nodule and gland produced general tuberculosis in a guinea-pig. The other glands showed no visible tuberculosis but were greatly enlarged, congested and œdematous and firm on section; they produced general tuberculosis in two guinea-pigs.

Lungs.—Numerous tubercles up to a millet seed in size, the smaller translucent, the larger caseous. Considerable fibrotic change. Tubercle bacilli very numerous and of moderate length. General tuberculosis was produced in a guinea-pig.

Mesenteric Glands.—Enlarged, firm, and some congested, but no visible tuberculosis; general tuberculosis was produced in three guinea-pigs.

Intestines.—Numerous tuberculous ulcers, varying up to a sixpence in size. General tuberculosis was produced in a guinea-pig.

Summary.

Direct cultures from an intestinal nodule and cultures, through guinea-pigs, from the mesenteric and bronchial glands and lung were eugonic; tested on rabbits, these cultures were of low virulence. Origin of infection probably respiratory.

H 90.

A. K., 3 years; female. General tuberculosis; meningitis.

Bronchial Glands.—Enlarged, and replaced by yellow caseous tissue, softening in parts; the largest was the size of a thrush's egg. Tubercle bacilli numerous, many slender and beaded. General tuberculosis was produced in one of two guinea-pigs inoculated.

Lungs.—Studded with caseous tubercles and dense caseous areas, measuring up to 2·5 × 2 cm.; one caseo-purulent nodule. Tubercle bacilli rather scanty and of various sizes.

Mesenteric Glands.—Moderately enlarged and beset with yellow caseating patches. Tubercle bacilli scanty. General tuberculosis was produced in two guinea-pigs.

Spleen.—Studded with caseating nodules; the majority miliary, a few as large as hemp seed.

Other Organs. Reported general dissemination, including meninges of brain.

Summary.

A direct culture from the mesenteric glands and a culture from the bronchial glands through a guinea-pig were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 92.

R. U., 3 years; female. Pulmonary and general tuberculosis

Cervical Glands.—Enlarged and replaced by very firm, fibro-caseous material.

Bronchial Glands.—Reported greatly enlarged and tuberculous.

Lungs.—Reported as "a mass of tuberculosis."

Mesenteric Glands.—Greatly enlarged and fused together; substance similar to cervical glands; tubercle bacilli very numerous, many slender and beaded. General tuberculosis was produced in two guinea-pigs.

Spleen.—One small tubercle found in substance.

Kidneys.—A minute tubercle in the cortex.

Intestines.—Throughout the length of the small intestine were numerous tuberculous ulcers, up to 2 × 1·2 cm. in area.

Summary.

A direct culture from the mesenteric glands was eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 93.

I. W., 9 years; female. Cirrhosis of liver; ascites; old pleurisy on right side. Tuberculin reaction positive.

Bronchial Glands.—The gland at the bifurcation was large and on section showed an opaque, yellowish grey, necrotic cortex.

Two glands at the root of the right lung contained bright yellow, encapsuled, soft, caseous, gritty nodules. In one of these nodules a group of about a dozen tubercle bacilli, rather degenerate, was seen. No tubercle bacilli were seen in the cortex of the gland at the bifurcation. Three guinea-pigs were inoculated with material including the lesions, but were found healthy when killed six weeks afterwards.

Lungs.—In the right lower lobe there was a cicatricial area about a shilling in size, near the margin, which was indented. Within this area were several bright yellow, soft, caseous and gritty nodules, up to a hemp seed in size; they were inoculated into three guinea-pigs which were found free from tuberculosis when they died 21, 27, and 28 days afterwards.

Mesenteric Glands.—Apparently normal. A guinea-pig was found healthy when killed six weeks after inoculation; a second, which died 20 days after inoculation was found free from tuberculosis.

Other Organs.—No visible tuberculosis.

Summary.

No tubercle bacilli obtainable. Origin of infection probably respiratory.

H 94.

J. D., 5 years; male. General tuberculosis; ascites; abdominal section.

Bronchial Glands.—One enlarged caseating gland reported at the bifurcation.

Lungs.—Scattered grey, submiliary tubercles. Three guinea-pigs inoculated with antiforminised tissue were found healthy when killed six weeks afterwards.

Mesenteric Glands.—Reported not visibly tuberculous.

Spleen.—One or two caseous miliary tubercles. The antiforminised tissue produced general tuberculosis in two guinea-pigs.

Kidneys.—No visible tubercles.

Liver.—No visible tubercles.

Intestines.—A Peyer's patch was ulcerated and in a smear from an opaque subperitoneal focus a few tubercle bacilli were seen.

Summary.

A culture from the spleen, through a guinea-pig was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 95.

R. G., 3 years; female. Pulmonary tuberculosis.

Bronchial Glands.—On the right side much enlarged, consisting of cysts, filled with turbid fluid and necrotic masses. On the left side moderately enlarged and studded with caseous foci and patches. Tubercle bacilli moderately numerous, long, and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—The right upper and part of the middle lobes were completely solid and composed of dense caseous substance. The

remaining portion of the right lung and the left lung were closely packed with caseous tubercles and nodules. Tubercle bacilli were scanty.

Mesenteric Glands. — Moderately enlarged; contained a few discrete caseous tubercles and patches. General tuberculosis was produced in two guinea-pigs.

Spleen.—Large, firm and closely filled with irregular caseous nodules up to a hemp seed in size. General tuberculosis was produced in a guinea-pig.

Kidneys.—A few miliary caseous nodules.

Liver.—Numerous tubercles.

Intestines.—No visible lesions.

Summary.

A direct culture from the bronchial glands and a culture from the mesenteric glands through a guinea-pig were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 96.

H. R., $2\frac{5}{6}$ years; male. Tuberculous meningitis.

Bronchial Glands.—Very small; no visible tuberculosis. Two guinea-pigs were found healthy when killed eight weeks after inoculation.

Lungs.—A little old pleurisy and some emphysema and bronchitis but no evidence of tuberculosis.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in three guinea-pigs.

Spleen.—No tubercles seen.

Kidneys.—No tubercles seen.

Liver.—A few grey foci were seen beneath the capsule but none internally. General tuberculosis was produced in a guinea-pig.

Intestines.—No ulceration.

Other Organs.—Report on Brain:—"Well marked tuberculous meningitis with classical distribution. Tubercles easily visible."

Summary.

Cultures, through guinea-pigs, from the mesenteric glands and liver were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 97.

E. D., $6\frac{5}{6}$ years; female. Pulmonary tuberculosis.

Bronchial Glands.—Greatly enlarged and caseous throughout; tubercle bacilli scanty. General tuberculosis was produced in two guinea-pigs.

Lungs.—Filled with large masses of tuberculous tissue; several cavities.

Mesenteric Glands.—Greatly enlarged and caseous throughout; tubercle bacilli in moderate numbers, some short and some long and beaded. General tuberculosis was produced in two guinea-pigs.

Intestines.—Extensive tuberculous ulceration.

Other Organs.—No tubercles visible in spleen, kidneys, or liver; pia mater of brain thickened and congested in parts but no tubercles visible.

Summary.

Direct cultures from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 99.

P. H., $9\frac{3}{4}$ years; male. Spinal caries; tuberculous rib with discharging sinus; albuminuria; ascites. von Pirquet reaction positive to human and bovine tuberculin.

Bronchial Glands.—No visible tuberculosis. Two guinea-pigs were found healthy when killed seven weeks afterwards.

Lungs. No evidence of tuberculosis.

Mesenteric Glands.—Were moderately and uniformly enlarged and contained from six to eight yellow miliary, caseo-calcareous tubercles. In two smears only three tubercle bacilli were seen, one being long and uniformly stained. Four guinea-pigs were killed seven weeks after inoculation; one showed general tuberculosis, the other three being healthy.

Spleen.—Moderately numerous yellow, caseo-calcareous nodules from a rape seed to a hemp seed in size. No tubercle bacilli were seen. Two guinea-pigs were inoculated but were found healthy when killed seven weeks afterwards.

Other Organs.—No visible tubercles in kidneys or intestines; liver reported lardaceous and caries of spine apparently healed.

Summary.

A culture, through a guinea-pig, from the mesenteric glands was dysgonic and of low virulence for rabbits. Origin of infection probably alimentary.

H 100.

F. W., $2\frac{1}{12}$ years; female. Meningitis.

Bronchial Glands.—The glands at the roots of both lungs and at the bifurcation were enlarged, up to a sparrow's egg, and almost entirely and firmly caseous; two were softening slightly. General tuberculosis was produced in two guinea-pigs.

Lungs.—Throughout the substance were sparsely scattered grey tubercles, the size of rape seed, with opaque centres.

Mesenteric Glands.—Slightly enlarged but no visible tuberculosis. Four guinea-pigs were inoculated but all died prematurely, in from 6 to 18 days, with no evidence of tuberculosis.

Spleen.—Beneath the capsule were seen a moderate number of minute translucent tubercles; on section a few slightly opaque tubercles were found.

Kidneys.—A single grey tubercle was seen in the cortex.

Intestines.—No evidence of tuberculosis.

Other Organs.—Report on brain:—"No naked eye manifestations of tubercle in the meninges, though they looked rather suspicious."

Summary.

A direct culture from the bronchial gland was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 102.

R. N., 5 years; male. Street accident.

Bronchial Glands.—Not visibly tuberculous, but general tuberculosis was produced in three guinea-pigs.

Lungs. Beneath the pleura was a single hard, miliary nodule; when crushed it was found to consist of caseo-calcareous substance in a fibrous capsule; no tubercle bacilli were seen in it; a guinea-pig was inoculated but was found free from tuberculosis when killed seven weeks afterwards.

Mesenteric Glands.—Slightly enlarged. In one was found a yellow, fibro-caseous, miliary nodule, in which no tubercle bacilli were seen; a guinea-pig was inoculated with it but was found healthy when killed seven weeks aferwards. In the other glands there was no visible tuberculosis, but an emulsion produced general tuberculosis in one out of three guinea-pigs inoculated.

Other Organs.—No visible tuberculosis.

Summary.

Cultures, through guinea-pigs, from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 103.

C. L., 6 years; male. Tuberculous meningitis.

Bronchial Glands.—On the right side they were slightly enlarged and several showed a few caseous tubercles up to a millet seed in size. On the left side the majority were enlarged, up to a sparrow's egg in size; some showed fibro-caseous patches, others were caseous throughout; tubercle bacilli were moderately numerous, some long and beaded. General tuberculosis was produced in a guinea-pig.

Lungs.—In the right lung were sparsely scattered, grey, submiliary tubercles. In the centre of the lower lobe of the left lung was a firm caseous patch, about ·5 cm. in diameter; otherwise the left lung was similar to the right.

Mesenteric Glands.—Apparently normal. Two guinea-pigs were found healthy when killed seven weeks after inoculation.

Spleen.—No visible tubercles.

Kidneys.—Reported that only two tubercles could be found.

Liver.—Reported to contain about half a dozen small grey tubercles.

Intestines.—Reported normal.

Other Organs.—The brain was reported to be affected with typical tuberculous meningitis.

Summary.

A culture obtained directly from the bronchial glands was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 105.

H. W., $2\frac{3}{4}$ years; female. Tabes mesenterica and tuberculous peritonitis.

Bronchial Glands.—Not visibly tuberculous, but general tuberculosis was produced in three guinea-pigs.

Lungs.—In both lungs, best seen beneath the pleura, were a moderate number of minute caseating tubercles.

Mesenteric Glands.—These formed a confluent caseous mass about the size of a cricket ball; on section they were found to be breaking down in many parts. Tubercle bacilli were very numerous, of moderate length, many beaded. General tuberculosis was produced in two guinea-pigs.

Spleen.—Sparsely scattered minute, grey tubercles.

Kidneys.—An occasional minute tubercle.

Liver.—Reported very pale and fatty, but no record of tubercles.

Intestines.—Extensive tuberculous ulceration throughout small intestine, especially marked in lower end of ileum and in caecum.

Other Organs.—Brain reported normal.

Summary.

A direct culture from the mesenteric glands and a culture from the bronchial glands through a guinea-pig were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 106.

G. W., 3 years; male. Pulmonary tuberculosis; pleurisy.

Bronchial Glands.—Greatly enlarged and almost wholly caseous; tubercle bacilli moderately numerous, many long. General tuberculosis was produced in two guinea-pigs.

Lungs. The left lung consisted almost entirely of a mass of tuberculous tissue containing large, ragged-walled and ramifying cavities. The right lung contained numerous caseous, miliary tubercles and several dark red areas of consolidation.

Mesenteric Glands.—Moderately enlarged; the majority showed numerous caseous patches and tubercles in the cortices, replacing a considerable part of the superficial cortex. Tubercle bacilli were scanty. General tuberculosis was produced in two guinea-pigs.

Spleen.—Fairly numerous yellow, caseous tubercles, up to a hemp seed in size.

Kidneys.—Sparsely scattered, caseating, submiliary tubercles.

Intestines.—Extensive tuberculous ulceration.

Summary.

A direct culture from the bronchial glands and a culture from the mesenteric glands through a guinea-pig were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 108.

A. T., 2 years; female. Fractured skull.

Mesenteric Glands.—Slight, uniform enlargement. No visible tuberculosis. One out of two guinea-pigs inoculated developed general tuberculosis, the other being found free from disease.

Other Organs.—No visible tuberculosis. Three guinea-pigs inoculated with bronchial glands were found free from tuberculosis when killed six weeks afterwards.

Summary.

A culture from the mesenteric glands, through a guinea-pig, was eugonic and of low virulence for rabbits. Origin of infection probably alimentary.

H 110.

B. M., 4½ years; female. Tuberculous meningitis.

Bronchial Glands.—On the right side they were all enlarged and caseous throughout, the largest being the size of a pigeon's egg. On the left side they were moderately enlarged, showing caseous foci and a few caseous patches. Tubercle bacilli were numerous, long and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—In the right lower lobe was a caseous nodule, ·5 cm. in diameter, surrounded by numerous smaller caseous nodules. Both lungs contained numerous submiliary, caseating tubercles.

Mesenteric Glands.—Moderately enlarged; a few small scattered, caseous nodules. Tubercle bacilli were scanty, long and beaded. General tuberculosis was produced in two guinea-pigs.

Spleen.—Numerous tubercles, varying from a grey point up to a caseous nodule nearly the size of a hemp seed.

Kidneys.—Beneath the capsule of one kidney was a single minute, grey tubercle.

Intestines.—In the walls of the small intestine were numerous minute, opaque tubercles and several small ulcers in Peyer's patches.

Other Organs.—Tubercles reported on meninges of brain.

Summary.

A direct culture from the bronchial glands and a culture from the mesenteric glands through a guinea-pig were eugonic and of low virulence for rabbits. Evidence as to portal of entry inconclusive.

H 112.

R. B., 4 years; male. Meningitis.

Bronchial Glands.—On the right side greatly enlarged and caseous throughout. On the left side slightly enlarged, showing an occasional caseous tubercle. Tubercle bacilli fairly numerous, irregular in size and shape, some long. General tuberculosis was produced in two guinea-pigs.

Lungs.—In the outer inferior margin of the right upper lobe was a solid yellow, caseous mass, measuring 6 × 2·5 × 2·5 cm.

In the rest of both lungs were numerous caseating miliary tubercles. Tubercle bacilli were moderately numerous and resembled those in the bronchial glands.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in three guinea-pigs.

Spleen.—Enlarged, and contained numerous grey, submiliary tubercles.

Kidneys.—In one kidney was a minute grey tubercle.

Intestines.—No ulceration.

Summary.

Direct cultures from the lung and bronchial glands and a culture, through a guinea-pig, from the mesenteric glands were eugonic. Tested on rabbits, the cultures from the bronchial and mesenteric glands were of low virulence. Origin of infection probably respiratory.

H 113.

G. T., 8 years; male. Sarcoma of duodenum; fatal hæmorrhage.

Mesenteric Glands.—One gland contained irregular caseo-calcareous granules, in which no tubercle bacilli were seen. In two smaller glands were two caseo-calcareous nodules, in which no tubercle bacilli were found. The remaining glands appeared normal. Four guinea-pigs were inoculated, two with the lesions and two with normal tissue; all were found free from tuberculosis when killed seven weeks afterwards.

Other Organs.—There was reported to be a caseo-calcareous gland in the omentum: no other visible tuberculosis. Three guinea-pigs inoculated with bronchial glands were found healthy when killed seven weeks afterwards.

Summary.

No tubercle bacilli obtainable. Origin of infection probably alimentary.

H 115.

F. O., 2 years; female. Meningitis; pulmonary tuberculosis.

Bronchial Glands.—The gland at the bifurcation measured 3·5 × 2 × 2 cm., was caseous throughout and was softening in the centre. The glands at the roots of both lungs were enlarged and almost completely caseous. Tubercle bacilli were fairly numerous and of moderate length. General tuberculosis was produced in two guinea-pigs.

Lungs.—Both were closely studded with miliary caseous tubercles. In the margin of the left inferior lobe at the lower extremity was a firm caseous patch, 1 × ·7 × ·5 cm.

Mesenteric Glands.—Slightly enlarged; several contained yellowish, friable, caseous nodules up to a hemp seed in size. Tubercle bacilli were scanty and rather shorter than those in the bronchial glands. General tuberculosis was produced in two guinea-pigs.

Spleen. Numerous miliary tubercles throughout, best seen beneath the capsule.

Kidneys.—An occasional minute grey focus in the cortices.

Intestines.—In the small intestine, about three feet from the ileo-caecal valve, was one greyish yellow nodule in a Peyer's patch, a little larger than a millet seed.

Summary.

Direct cultures from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 116.

F. E. H., 6 years; female. Middle ear disease; meningitis.

Bronchial Glands.—In one were found two yellow, calcareous miliary nodules. General tuberculosis was produced in three guinea-pigs.

Lungs.—No visible tuberculosis.

Other Organs.—No visible tuberculosis. An emulsion of the mesenteric glands failed to produce tuberculosis in three guinea-pigs. The brain was reported to be in a condition of acute purulent meningitis.

Summary.

A culture from the bronchial glands, through a guinea-pig, was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 117.

A. H., 3 years; male. Caries of spine; pleurisy; peritonitis.

Bronchial Glands.—No visible tuberculosis. Two guinea-pigs were found free from disease when killed six weeks after inoculation.

Lungs.—No visible tuberculosis.

Mesenteric Glands.—There were three masses of enlarged glands, the largest single gland being about the size of a sparrow's egg; the capsules were thickened and fibrous and contained softening caseous substance. A few slightly enlarged glands contained single tubercles. Tubercle bacilli were fairly numerous, short, and some broken up. Two guinea-pigs and a rabbit were inoculated: the guinea-pigs were found free from disease when killed six weeks aferwards; the rabbit showed a local lesion only when killed after 105 days.

Spleen.—No visible tuberculosis.

Intestines.—No visible tuberculosis.

Other Organs.—Reported free from visible tuberculosis.

Summary.

No tubercle bacilli obtainable. Direct cultures from the mesenteric glands remained sterile. Origin of infection probably alimentary.

H 118.

W. P., 6 years; male. Tuberculous meningitis; general tuberculosis.

Bronchial Glands.—On the right side they were enlarged and fibro-caseous throughout; on the left side they contained discrete tubercles. Tubercle bacilli were scanty, of moderate length and

uniformly stained. General tuberculosis was produced in a guinea-pig; a second guinea-pig, which died 26 days after inoculation, was found free from tuberculosis.

Lungs.—Both lungs were crowded with small tubercles. In the right apex was a small cavity containing caseo-pus in which tubercle bacilli were very numerous.

Mesenteric Glands.—Six were moderately enlarged and each contained a caseous nodule up to a hemp seed in size. Tubercle bacilli were scanty, some long and beaded. General tuberculosis was produced in two guinea-pigs.

Intestines.—No visible tuberculosis.

Other Organs.—It was reported that there was general dissemination and extensive basal tuberculous meningitis.

Summary.

Direct cultures from the mesenteric and bronchial glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 120.

E. M., 4¼ years; female. Hip disease; meningitis.

Bronchial Glands.—Two glands at the bifurcation were slightly enlarged and contained discrete, yellow, caseous nodules. A third gland contained a few tubercles. General tuberculosis was produced in two guinea-pigs.

Lungs.—Both were closely filled with submiliary grey tubercles. At the base of the left inferior lobe, just beneath the pleura, was a softening caseous nodule within a fibrous capsule about the size of a pea; it contained numerous tubercle bacilli. General tuberculosis was produced in three guinea-pigs.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in three guinea-pigs.

Spleen.—Fairly numerous grey foci. In the margin was a bright yellow, triangular, necrotic area, about 2·5 × 1·5 × 1·5 cm.; no tubercle bacilli were seen in this lesion but it produced general tuberculosis in a guinea-pig.

Kidneys.—Fairly numerous minute grey tubercles in the cortices.

Other Organs.—The brain showed basal and general meningitis, with grey tubercles in the pia mater.

Summary.

A direct culture from the spleen, and cultures, through guinea-pigs, from mesenteric and bronchial glands and lung, were eugonic. Tested on rabbits, the cultures from the mesenteric and bronchial glands and spleen were of low virulence. Origin of infection probably respiratory.

H 121.

H. C., 6 years; male. Tuberculous meningitis.

Bronchial Glands.—No visible tuberculosis. Three guinea-pigs died prematurely; two others, inoculated with the antiforminised

tissue, were found free from tuberculosis 36 and 42 days afterwards.

Lungs.—"Small tubercles" were reported.

Mesenteric Glands.—The glands examined were small and apparently normal with the exception of one which contained a calcareous nodule the size of a wheat grain; no tubercle bacilli were seen in it. Four guinea-pigs were inoculated but were all found free from tuberculosis when killed six weeks afterwards.

Spleen.—There were four submiliary fibrous tubercles, slightly opaque centrally. No tubercle bacilli were seen but general tuberculosis was produced in two guinea-pigs inoculated with antiforminised material.

Liver.—A few minute, grey, scattered tubercles. General tuberculosis was produced in a guinea-pig inoculated with the antiforminised material.

Kidneys.—No visible tuberclosis.

Intestines.—Reported free from tuberculosis.

Other Organs.—Brain reported "in condition of tuberculous meningitis with acute hydrocephalus."

Summary.

Cultures, through guinea-pigs, from the liver and spleen were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 125.

J. P., 6½ years; male. Acute ulcerative enteritis.

Bronchial Glands.—On the right side and in the bifurcation the glands were caseous throughout and softening, the largest being the size of a thrush's egg. On the left side the glands were small and apparently normal. Tubercle bacilli were numerous in the lesions, long, irregular and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—In the inferior margin of the right upper lobe was a solid triangular area, 4 × 3 × 2 cm., consisting of yellow caseous softening masses, two small cavities, and a little consolidated lung. The rest of the lung tissue on both sides showed a few submiliary caseating tubercles. Tubercle bacilli were scanty, long, irregular and beaded.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in two guinea-pigs.

Spleen.—Sparsely scattered tubercles varying from a grey focus up to a caseous nodule the size of a millet seed. Tubercle bacilli were scanty, long, irregular and beaded.

Liver.—Flattened grey tubercles on the surface. An occasional minute tubercle on section.

Other Organs.—It was reported that the intestines showed no tuberculous ulceration, but there was superficial ulceration of the large intestine with petechial hæmorrhages throughout its length.

Summary.

A direct culture from the bronchial glands and a culture from the mesenteric glands through a guinea-pig were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 126.

I. V. P., 5½ years; female. Pulmonary tuberculosis with general dissemination. von Pirquet reaction negative.

Bronchial Glands.—Much enlarged on both sides, the largest being nearly the size of a hen's egg; composed throughout of firm, yellow, caseous substance, softening around periphery in parts. Tubercle bacilli numerous, many long and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—Both lungs closely filled with caseous nodules, up to ·5 cm. in diameter and to a large extent confluent.

Mesenteric glands.—One was caseous through and another partially; several appeared normal. Tubercle bacilli were numerous, many long and beaded. General tuberculosis was produced in two guinea-pigs.

Spleen.—Enlarged and closely filled with firm, yellow, caseous nodules, up to ·5 cm. in diameter.

Kidneys.—Fairly numerous discrete, caseous nodules, up to a hemp seed in size and surrounded with a small area of congestion.

Liver.—Numerous tubercles, the smallest minute and translucent, the largest firm, yellow, and the size of hemp seed.

Intestines.—No ulceration.

Other Organs.—A miliary caseous nodule on the endocardium of the right ventricle of the heart.

Summary.

Direct cultures from the mesenteric and bronchial glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 128.

C. G., 4 years; female. Tuberculous meningitis.

Bronchial Glands.—Not appreciably enlarged. A gland on the right side near the root of the lungs contained four or five minute, opaque tubercles; a second small gland showed a single tubercle; the rest appeared normal. General tuberculosis was produced in three guinea-pigs.

Lungs.—At the left apex was a nodule the size of a robin's egg, caseous throughout and in parts softening and becoming caseo-purulent; it contained tubercle bacilli in moderate numbers. Minute grey tubercles were found in the left lower lobe and two minute tubercles were seen in the right lung. General tuberculosis was produced in two guinea-pigs.

Mesenteric Glands.—Not enlarged; in each of two there was a single opaque miliary nodule consisting of encapsuled caseo-calcareous material; it contained a few tubercle bacilli. General tuberculosis was produced in two guinea-pigs.

Spleen.—A few tubercles.

Kidneys.—No visible tubercles.

Liver.—A few tubercles.

Intestines.—One small, superficial, recent ulcer was reported in the ileum.

Other Organs.—The brain was reported as showing "typical tuberculous meningitis with hydrocephaly and white softening."

Summary.

Direct cultures from the lung and cultures, through guinea-pigs, from the bronchial and mesenteric glands were eugonic; tested on rabbits, the two latter were of low virulence. Origin of infection probably respiratory.

H 130.

A. G., 3 years; male. Pulmonary tuberculosis with general dissemination.

Bronchial Glands.—Caseous throughout, the largest the size of a sparrow's egg; tubercle bacilli numerous, many short, a few long and beaded. General tuberculosis produced in two guinea-pigs.

Lungs.—Both densely packed with caseating, confluent tuberculous nodules.

Mesenteric Glands.—Not much enlarged; the majority contained discrete, completely caseous tubercles, the largest the size of hemp seed. Tubercle bacilli as in bronchial glands. General tuberculosis was produced in two guinea-pigs.

Spleen.—Three-fourths of the tissue replaced by confluent caseous masses.

Kidneys.—Scattered tubercles.

Liver.—Numerous tubercles.

Intestines.—A few small tuberculous ulcers reported in small intestine.

Other Organs. — Brain reported free from tuberculous meningitis.

Summary.

Direct cultures from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 132.

H. R. S., 4 years; female. Measles followed by broncho-pneumonia.

Bronchial Glands.—The majority were enlarged, up to a thrush's egg, and caseous throughout; others showed caseous patches; a few on the right side showed no caseation. Tubercle bacilli were fairly numerous, some long and beaded. General tuberculosis was produced in two guinea-pigs.

Lungs.—On the surface of the left upper lobe, at the inferior margin, was an area, about 3 cm. in diameter, of adherent fibrin; in the underlying lung was a firm caseous nodule, 1 × ·7 cm., surrounded by discrete tubercles and small caseous patches. In the rest of the lungs a few minute grey tubercles were seen. Tubercle bacilli as in the bronchial glands.

Mesenteric Glands.—No visible tuberculosis, but general tuberculosis was produced in two guinea-pigs.

Spleen.—Sparsely scattered tubercles, from a grey point up to a rape seed; the larger caseous.

Kidneys.—No tubercles.

Intestines.—Congested; no ulceration.

Summary.

Cultures, through guinea-pigs, from the bronchial and mesenteric glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 134.

A. F., 4 years; male.—Tuberculous meningitis.

Bronchial Glands.—On the right side they were extensively caseous. Tubercle bacilli were scanty, long and irregular. General tuberculosis was produced in two guinea-pigs.

Lungs.—Miliary tubercles scattered through both lungs. A few caseous nodules in the interior part of the upper lobe of the right lung.

Mesenteric Glands.—No visible tuberculosis, but general tuberculosis was produced in three guinea-pigs.

Spleen.—Packed with yellow tubercles.

Liver.—Many miliary tubercles.

Kidneys.—A few small tubercles.

Intestines.—Reported free from ulceration.

Other Organs.—It was reported that there was "extensive basal tuberculous meningitis with hydrocephalus and white softening of the ventricular walls."

Summary.

A direct culture from the bronchial glands and a culture from the mesenteric glands, through a guinea-pig, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 136.

A. F., 4½ years; male. Tuberculous meningitis.

Bronchial Glands.—On the right side one gland contained a pea-sized caseous nodule, in which one bacillus was seen; the other glands appeared normal. General tuberculosis was produced in two guinea-pigs, a third being found healthy when killed six weeks after inoculation.

Lungs.—It was reported that "an old caseous focus the size of a pea was found in the lower lobe of the right lung anteriorly and smaller softening foci of puriform material in the lower

anterior edge of the right middle lobe. Lungs generally congested. No pleural adhesions or inflammation."

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in two guinea-pigs, a third, which died 34 days after inoculation, being found free from tuberculosis.

Spleen and Kidneys.—No visible tuberculosis.

Liver.—A few grey tubercles reported on the surface.

Intestines.—It was reported that "all the Peyer's patches were congested and several showed slight superficial ulceration with a few small yellowish foci."

Other Organs.—In the brain was reported "well marked recent tuberculous meningitis with ventricular distension and some white softening."

Summary.

Cultures from the mesenteric and bronchial glands, through guinea-pigs, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 140.

J. W., 6 years; male.—Intestinal tuberculosis; perforation.

Bronchial Glands.—Apparently normal, but general tuberculosis was produced in two guinea-pigs.

Lungs.—No visible tuberculosis.

Mesenteric Glands.—Enlarged, the largest the size of a sparrow's egg. Some were almost entirely replaced by softening caseous substance; the majority contained caseous patches and nodules. Tubercle bacilli were fairly numerous and either short or of only moderate length. General tuberculosis was produced in two guinea-pigs.

Intestines.—Reported tuberculous ulceration which had perforated.

Other Organs.—No visible tuberculosis.

Summary.

Cultures, through guinea-pigs, from the mesenteric and bronchial glands were dysgonic and of high virulence for rabbits. Origin of infection probably alimentary.

H 141.

M. E., 6 years; female. Tuberculous meningitis.

Bronchial Glands.—Two glands on the left side were enlarged and almost caseous throughout, one firm, the other softening. The remaining glands were small and not visibly tuberculous. In the lesions tubercle bacilli were moderately numerous and fairly long. General tuberculosis was produced in two guinea-pigs.

Lungs.—In the left upper lobe was an irregular caseous area, 1 × ·6 cm. Miliary tubercles were frequent in both lungs and in both basal lobes were areas of reddish grey consolidation.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in three guinea-pigs.

Spleen.—Moderately numerous miliary, caseous tubercles in the substance and numerous flattened grey tubercles on the capsule.

Kidneys.—A few grey tubercles.

Liver.—A few scattered grey tubercles.

Intestines.—No ulceration.

Summary.

A direct bronchial gland culture and a culture from the mesenteric glands, through a guinea-pig, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 142.

I. M., 5 years; female. Tuberculous meningitis.

Bronchial Glands.—At the bifurcation and on the left side they were enlarged and caseous throughout; on the right side they were partially caseous. Tubercle bacilli were moderately numerous, some long and beaded. General tuberculosis was produced in a guinea-pig.

Lungs.—Sparsely scattered miliary tubercles.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in two guinea-pigs.

Kidneys.—No visible tubercles.

Liver and Spleen.—Scattered miliary tubercles.

Other Organs.—Reported tuberculous meningitis.

Summary.

A direct bronchial gland culture and a culture from the mesenteric glands, through a guinea-pig, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 143.

W. R., 5 years; male. Diabetes mellitus; pulmonary tuberculosis; pneumothorax.

Bronchial Glands.—All enlarged; several replaced by firm yellow, caseous substance, softening in some; other glands were partly caseous or contained discrete nodules. Tubercle bacilli were long and scanty. General tuberculosis was produced in two guinea-pigs.

Lungs.—The pleura of the left lung was covered with a thick yellow membrane which easily stripped off; the upper lobe contained several cavities lined with caseous substance; in both lobes were numerous caseous nodules up to 1 cm. in diameter. The right lung contained scattered nodules up to a small pea in size.

Mesenteric Glands.—Apparently normal. Three guinea-pigs were found healthy when killed six weeks after inoculation.

Spleen.—Moderately numerous yellow, miliary nodules.

Kidneys.—Several grey caseating nodules up to a pea in size.
Liver.—Scattered caseous nodules up to a millet seed.
Intestines.—No ulceration.

Summary.

Direct cultures from the bronchial glands were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 144.

G. S., 9½ years; male. Morbus cordis.
Bronchial Glands.—No visible tuberculosis. Three guinea-pigs were found free from tuberculosis when killed six weeks after inoculation.
Mesenteric Glands.—A gland nearly the size of a pigeon's egg consisted of a thin capsule filled with soft, whitish, pultaceous substance. A second gland, the size of a large pea, consisted of a thick capsule and soft whitish substance containing calcareous granules. Tubercle bacilli were scanty and all short. Five guinea-pigs were inoculated but were found free from tuberculosis when killed six weeks afterwards.
Other Organs.—No visible tuberculosis.

Summary.

No tubercle bacilli obtainable. Direct cultures made from the mesenteric glands remained sterile. Origin of infection probably alimentary.

H 146.

G. F., 5 years; female. Tuberculous meningitis; general tuberculosis.
Bronchial Glands.—On the right side they were enlarged, up to a pigeon's egg, and composed of friable yellow, caseous substance. On the left side they were moderately enlarged and contained discrete caseous tubercles. Tubercle bacilli were numerous. General tuberculosis was produced in a guinea-pig.
Lungs.—Both contained numerous miliary, caseous tubercles, confluent in parts.
Mesenteric Glands.—Not much enlarged; six contained discrete caseous nodules, and one gland, about the size of a hemp seed, was caseous throughout. Tubercle bacilli were scanty. General tuberculosis was produced in two guinea-pigs.
Spleen.—Numerous caseous nodules up to a hemp seed in size and becoming in one part confluent.
Kidneys.—Scattered miliary tubercles.
Liver.—Fairly numerous tubercles, up to a millet seed.
Intestines.—No ulceration.
Other Organs.—Reported typical tuberculous meningitis of brain.

Summary.

Cultures from the bronchial and mesenteric glands, through guinea-pigs, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 147.

L. R., 8 years; male. Tuberculous meningitis.

Bronchial Glands.—On the left side was a gland the size of a pigeon's egg composed of caseous substance becoming caseo-purulent (tubercle bacilli numerous). A second gland, about half the size of the above, was caseous throughout (tubercle bacilli scanty). Other glands on both sides were moderately enlarged and congested; some of them contained tubercles. General tuberculosis was produced in two guinea-pigs.

Lungs.—Pleurisy on both sides. Parenchyma of both lungs contained very numerous miliary, caseating tubercles. In the upper left lobe there was a firm, oblong caseous nodule, 1 cm. in greatest diameter.

Mesenteric Glands.—Apparently normal, but general tuberculosis was produced in three guinea-pigs.

Spleen.—Scattered yellow, caseous tubercles, up to a millet seed in size, also several loosely attached peritoneal tubercles on the concave surface.

Kidneys.—In the cortices were numerous translucent tubercles, up to a millet seed, only a few of which were definitely opaque and caseous in the centre.

Liver.—Scattered minute, caseating tubercles.

Intestines.—No ulceration.

Summary.

A direct bronchial gland culture and a culture from the mesenteric glands, through a guinea-pig, were eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 149.

L. P., $3\frac{3}{4}$ years; female. Pneumonia; meningitis.

Bronchial Glands.—Almost all were fibro-caseous. The gland at the bifurcation was firm and translucent, with caseous points. Tubercle bacilli were very scanty. General tuberculosis was produced in a guinea-pig.

Lungs.—Non-tuberculous pneumonic consolidation of both lungs. In addition, there was a small cavity, 1 cm. in diameter, lined by caseous substance, on the right side. In a smear from the cavity a few tubercle bacilli were seen.

Mesenteric Glands.—Apparently normal. No tuberculosis was found in three guinea-pigs which died 26, 40 and 42 days after inoculation.

Spleen.—Scattered tubercles, up to a millet seed; the largest fibrous with caseous centres. No tubercle bacilli were seen in a smear.

Kidneys.—No visible tubercles.

Liver.—A few small tubercles.

Intestines.—Reported no ulceration.

Other Organs.—Reported "vertical and basal meningitis."

Summary.

A direct bronchial gland culture was eugonic and of low virulence for rabbits. Origin of infection probably respiratory.

H 150.

F. R., 2¾ years; female.—Tuberculous peritonitis.

Bronchial Glands.—No visible tuberculosis, but general tuberculosis was produced in one out of three guinea-pigs inoculated.

Lungs.—Miliary caseous tubercles, up to ·2 cm., were sparsely scattered throughout both lungs.

Meserteric Glands.—All much enlarged, up to a sparrow's egg, and caseous throughout; tubercle bacilli numerous, short or of moderate length, and often degenerate. General tuberculosis was produced in two guinea-pigs.

Spleen and Kidneys.—No visible tubercles.

Liver.—A few yellow, caseous tubercles, up to ·2 cm., on surface and in substance.

Intestines.—Numerous tuberculous ulcers, some of which had almost perforated. Intestines densely matted together with adhesions.

Summary.

A direct mesenteric gland culture and a bronchial gland culture, through a guinea-pig, were eugonic and of low virulence for rabbits. Origin of infection probably alimentary.

Table III.—The 56 cases showing no Macroscopic Evidence of Tuberculosis; Inoculation Experiments with Bronchial and Mesenteric Glands Negative.

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Number of guinea-pigs found free from tubercle bacilli six weeks after inoculation.		Addenda.
				Inoculated with mesenteric glands.	Inoculated with bronchial glands.	
5	2	M.	Pleurisy and bronchitis after whooping cough and measles.	2	3	In addition, one guinea-pig inoculated with cervical glands and two inoculated with spleen were found free from tuberculosis six weeks afterwards.
7	2	F.	Broncho-pneumonia	4	4	
9	10	M.	Rheumatism; morbus cordis	3	3	
10	2½	M.	Broncho-pneumonia	3	3	
13	2½	M.	Lobar pneumonia	3	3	
15	3	M.	Otorrhœa; lobar pneumonia	3	0	The three guinea-pigs inoculated with bronchial glands all died prematurely.
18	4	M.	Otorrhœa; abscess of lung; pleurisy	3	3	
19	8	F.	Fractured pelvis; hæmorrhage ...	3	2	A third guinea-pig inoculated with bronchial glands died prematurely.
20	2⅓	F.	Diarrhœa and vomiting	2	3	Three other guinea-pigs inoculated with mesenteric glands died prematurely.
22	5	M.	Hæmophilia; hæmorrhage	3	3	Two other guinea-pigs inoculated with mesenteric glands died prematurely.
24	4	F.	Gangrenous appendicitis; general peritonitis.	3	4	A fifth guinea-pig inoculated with bronchial glands died prematurely.
30	9	M.	Chronic enteritis; tuberculin reaction negative; chronic catarrhal condition of large intestine; mesenteric glands enlarged but not caseous.	3	3	

31	4	F.	General peritonitis ; septicæmia	2	2	A third guinea-pig inoculated with mesenteric glands and a third inoculated with bronchial glands died prematurely.
35	$2\frac{2}{3}$	F.	Volvulus ; gangrene of intestine ; peritonitis.	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
45	3	F.	Street accident ; double pneumothorax	3	3	
51	8	F.	Chorea ; endocarditis	3	3	
52	$4\frac{1}{4}$	F.	Whooping cough ; broncho-pneumonia	3	3	
54	4	M.	Measles ; broncho-pneumonia... ...	5	3	
55	4	F.	Pericarditis ; chronic bronchitis ; pleurisy ; meningitis.	4	3	
58	2	M.	Hæmorrhagic broncho - pneumonia ; thymus not atrophied.	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
61	5	M.	Pneumococcal septicæmia and pericarditis after measles and pneumonia.	2	3	A third guinea-pig inoculated with mesenteric glands died in 16 days and a fourth died in 38 days.
63	$2\frac{1}{3}$	M.	Broncho - pneumonia ; pneumococcal meningitis.	3	2	A third guinea-pig inoculated with bronchial glands died prematurely.
64	$2\frac{1}{2}$	M.	Empyæma	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
65	10	M.	Fractured skull...	3	3	
66	4	M.	Empyæma ; pericarditis ; cirrhosis of liver.	3	3	
67	$2\frac{3}{4}$	M.	Sudden vomiting, diarrhœa and collapse ; ? toxæmia.	3	3	
69	4	M.	Diphtheria	3	3	
73	$4\frac{1}{2}$	F.	Measles ; broncho-pneumonia... ...	3	3	
74	5	F.	Morbus cordis	3	3	
77	7	M.	Lobar pneumonia ; pericarditis ; nephritis.	3	3	
80	$3\frac{3}{4}$	M.	Broncho-pneumonia	3	3	
82	$2\frac{1}{12}$	M.	Poliomyelitis ; pneumonia	2	2	A third guinea-pig inoculated with mesenteric glands died in 38 days and a third inoculated with bronchial glands died in six days.

No of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Number of Guinea-pigs found free from Tubercle Bacilli six weeks after Inoculation.		Addenda.
				Inoculated with Mesenteric Glands.	Inoculated with Bronchial Glands.	
84	$8\frac{1}{2}$	M.	Septicæmia	2	2	A third guinea-pig inoculated with mesenteric glands died in 36 days and a third inoculated with bronchial glands died in six days.
88	5	M.	Whooping cough ; measles ; broncho-pneumonia ; fibrosis of right lung.	4	3	
91	$3\frac{1}{2}$	M.	Measles ; bronchitis ; broncho-pneumonia.	3	2	A third guinea-pig inoculated with bronchial glands died prematurely.
98	6	F.	Acute periostitis of femur	2	2	A third guinea-pig inoculated with mesenteric glands died in 34 days and a third inoculated with bronchial glands died in 29 days.
101	7	F.	Glioma of cerebellum	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
104	$3\frac{1}{2}$	F.	Tumour of pons	3	3	
107	3	F.	Zymotic enteritis	3	2	A third guinea-pig inoculated with bronchial glands died prematurely.
109	3	M.	Broncho-pneumonia	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
111	5	M.	Broncho-pneumonia	3	3	
114	$2\frac{1}{6}$	F.	Broncho-pneumonia	2	2	A third guinea-pig inoculated with mesenteric glands and a third inoculated with bronchial glands died prematurely.
119	$4\frac{1}{2}$	F.	Sudden vomiting and convulsions ; large thymus.	2	2	A third guinea-pig inoculated with mesenteric glands died in 30 days and a third inoculated with bronchial glands died in five days
122	9	M.	Cerebro-spinal meningitis	3	3	
123	$2\frac{11}{12}$	F.	Whooping cough	3	3	

124	2	M.	Intussusception ; broncho-pneumonia	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
127	5	F.	Broncho-pneumonia ; cancrum oris ...	3	3	
129	$5\frac{2}{3}$	M.	Acute lymphadenoma ; cervical, bronchial and mesenteric glands affected ; also spleen.	3	3	Two guinea-pigs inoculated with cervical glands failed to develop tuberculosis in 35 and 42 days. Cultures from mesenteric, bronchial and cervical glands and from spleen remained sterile.
131	$3\frac{11}{12}$	F.	Broncho-pneumonia	1	1	A second guinea-pig inoculated with bronchial glands died in 32 days. Three other guinea-pigs inoculated with bronchial glands and two with mesenteric glands died prematurely.
133	3	M.	Idiocy ; paralysis ; broncho-pneumonia	3	2	A third guinea-pig inoculated with bronchial glands died in 34 days.
135	2	F.	Broncho-pneumonia	3	2	A third guinea-pig inoculated with bronchial glands died in 30 days.
137	3	M.	Broncho-pneumonia	2	2	A third guinea-pig inoculated with bronchial glands and a third with mesenteric glands died prematurely.
138	4	M.	Epilepsy	2	3	A third guinea-pig inoculated with mesenteric glands died prematurely.
139	$2\frac{5}{12}$	F.	Convulsions ; large thymus	2	2	A third guinea-pig inoculated with bronchial glands and a third with mesenteric glands died prematurely.
145	$2\frac{3}{4}$	F.	Measles ; broncho-pneumonia ; empyæma.	1	2	A second guinea-pig inoculated with mesenteric glands died in 39 days and a third in 17 days. A third guinea-pig inoculated with bronchial glands died in three days.
148	4	M.	Measles ; broncho-pneumonia... ...	2	1	A third guinea-pig inoculated with mesenteric glands died in 31 days. A second guinea-pig inoculated with bronchial glands died in 23 days and a third in 11 days.

*Table IV.—Macroscopic lesions of Tuberculosis but failure to obtain living Tubercle Bacilli. Tubercle Bacilli were demonstrated in smears except in the four cases marked thus.**

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Organs Macroscopically Tuberculous.	Results of Investigation.
1	7	M.	Tuberculous hip disease; ruptured tuberculous gland in region of appendix; peritonitis.	Calcareous nodules in bronchial glands and one in a mesenteric gland. A few grey nodules, the size of millet seed, in the lungs. In smears from lungs and bronchial glands a few tubercle bacilli were seen.	Cultures from two bronchial glands remained sterile. All the guinea-pigs inoculated failed to develop tuberculosis (three from bronchial glands, two from mesenteric glands, and three from spleen). Cultures from the spleens and other tissues of these guinea-pigs remained sterile.
12	4	M.	Diphtheria 12 months previously; death from laryngeal obstruction.	One mesenteric gland, the size of a sparrow's egg, contained two nodules consisting of soft, yellowish, caseous, slightly gritty material surrounded by thick, fibrous walls. In a smear a moderate number of tubercle bacilli were seen, the majority being short.	A culture from the mesenteric gland remained sterile; three guinea-pigs and a rabbit failed to develop tuberculosis. Three guinea-pigs inoculated with the bronchial glands failed to develop tuberculosis. Cultures from the spleens of all the above animals remained sterile.
*21	6	M.	Morbus cordis	One brownish caseous nodule the size of a millet seed in the lungs (no tubercle bacilli seen in smear); in the spleen two fibrous nodules less than rape seed in size (no tubercle bacilli seen in smears from each); a single grey submiliary tubercle with an opaque centre on the surface of the liver.	Three guinea-pigs were inoculated with mesenteric glands, three with bronchial glands, three with spleen, two with the liver tubercle, and one with tonsil; all were found free from tuberculosis when killed 42 days afterwards; cultures from four remained sterile.
*25	8	F.	Fracture of skull; septic meningitis.	In the lungs, beneath the pleura, were two nodules, one the size of a millet seed, the other the size of a hemp seed, composed of chalky material in a fibrous capsule.	Two guinea-pigs inoculated with the lung nodules were found free from tuberculosis when killed 42 days afterwards; cultures from their spleens remained sterile. Three guinea-pigs inoculated with mesenteric glands, three with bronchial glands, and three with spleen were all found free from tuberculosis when killed 42 days afterwards.

*29	6	M.	Gangrenous appendicitis ; general peritonitis.	Two caseous, gritty miliary tubercles beneath the pleura of lungs.	Two guinea-pigs inoculated with the lung tubercles were free from tuberculosis 45 days afterwards and cultures from their spleens remained sterile. Three guinea-pigs inoculated with mesenteric glands and three with bronchial glands were free from tuberculosis 45 days afterwards. Cultures from the lung and bronchial glands remained sterile. Three guinea-pigs inoculated with mesenteric glands and three with bronchial glands were found free from tuberculosis six weeks afterwards ; cultures from the spleens of all six animals remained sterile.
36	4	F.	Acute diarrhœa ; early pericarditis.	In the margin of the upper lobe of the left lung was a small nodule containing firm caseous substance and surrounded by a thick fibrous capsule ; no tubercle bacilli were seen in a smear. Two small bronchial glands were completely caseous and surrounded by dense fibrous capsules ; in a smear two tubercle bacilli were seen.	
*42	3	F.	Street accident ; ruptured liver ; large thymus.	In the margin of the right lower lobe of the lungs were two nodules, one the size of a millet seed, the other rather smaller, composed of yellowish white, gritty substance. No tubercle bacilli were seen in smears from each.	Two guinea-pigs inoculated with the lung nodules were found free from tuberculosis 44 days days afterwards. Three guinea-pigs inoculated with mesenteric glands and two from bronchial glands were also free from tuberculosis 44 days afterwards. Cultures from the bronchial glands remained sterile ; three guinea-pigs were found healthy 43 days after inoculation ; cultures from their spleens remained sterile. Three guinea-pigs were inoculated with mesenteric glands and were found healthy 43 days afterwards. Cultures from bronchial glands and lungs remained sterile. Three guinea-pigs inoculated with bronchial glands were found healthy 42 days afterwards ; cultures from the spleens of two remained sterile. Three guinea-pigs inoculated with lung nodules and also three inoculated with mesenteric glands were found healthy 42 days afterwards.
44	10	F.	Morbus cordis	Three bronchial glands contained small caseo-calcareous tubercles ; in smears a few tubercle bacilli were seen.	
49	7	M.	Street accident	In the lungs were four small caseo-calcareous nodules and also a small collection of fibrous, translucent tubercles ; in smears a few tubercle bacilli were found. One bronchial gland contained a small caseous nodule ; in a smear no tubercle bacilli were seen.	

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Organs Macroscopically Tuberculous.	Results of Investigation.
57	4½	M.	Fractured skull	In the mesentery was a mass the size of a partridge's egg, composed of two or three glands which were filled with caseous, slightly gritty substance easily shelling out of firm capsules. In smears tubercle bacilli were moderately numerous and fairly short.	Three guinea-pigs inoculated with mesenteric glands were found healthy 43 days afterwards; cultures from their spleens remained sterile. Three guinea-pigs inoculated with bronchial glands were found healthy 43 days afterwards.
68	6	F.	Idiot: hydrocephalus; congenital syphilis; rickets; extreme emaciation.	One mesenteric gland was completely caseous; three others each showed one minute caseous focus; in smears tubercle bacilli were moderately numerous and rather short.	A culture from the mesenteric gland remained sterile; two guinea-pigs were found healthy when killed 43 days after inoculation; cultures from their spleens remained sterile. Three guinea-pigs inoculated with bronchial glands were found healthy 43 days after inoculation.
72	5	F.	Broncho-pneumonia... ...	In each of four mesenteric glands was a single, yellow, caseous, encapsuled nodule, about the size of a hemp seed. In smears a few short tubercle bacilli were seen.	Cultures from the mesenteric glands remained sterile; three guinea-pigs were found free from tuberculosis 45 days after inoculation; cultures from the spleens of two remained sterile. Three guinea-pigs inoculated with bronchial glands were found healthy 45 days afterwards.
83	9	F.	Cirrhosis of liver; ascites; old pleurisy on right side.	In the lower lobe of the right lung was a cicatricial area, the size of a shilling, within which were several soft, yellow, caseous and gritty nodules up to a hemp seed in size. Two bronchial glands contained soft, caseous and gritty, encapsuled nodules; in a smear a few tubercle bacilli were found.	Three guinea-pigs inoculated with the lung tubercles died respectively in 21, 27 and 28 days and were found free from tuberculosis. Three guinea-pigs inoculated with bronchial glands were found healthy 42 days afterwards. Two guinea-pigs inoculated with mesenteric glands failed to develop tuberculosis.

*113	8	M.	Sarcoma of duodenum; fatal hæmorrhage.	In three mesenteric glands caseo-calcareous nodules were found; in a smear no tubercle bacilli were seen.	Four guinea-pigs inoculated with mesenteric glands and three inoculated with bronchial glands were found healthy when killed 50 days afterwards.
117	3	M.	Pleurisy; peritonitis ...	Several of the mesenteric glands were much enlarged and partially adherent; on section these were caseous throughout and surrounded by fibrous capsules; some slightly enlarged glands contained single tubercles. Smears showed fairly numerous, short tubercle bacilli.	In direct cultures from the mesenteric glands tubercle bacilli failed to appear in two months. Two guinea-pigs inoculated with the mesenteric glands and two inoculated with the bronchial glands were found healthy when killed 44 days afterwards.
144	9½	M.	Morbus cordis	A mesenteric gland, nearly the size of a pigeon's egg, consisted of a thin capsule filled with whitish pultaceous substance; a second mesenteric gland, the size of a large pea, consisted of a thick capsule containing soft whitish substance with calcareous granules. In smear preparations a few short tubercle bacilli were seen.	Direct cultures remained sterile. Five guinea-pigs inoculated with the glands failed to develop tuberculosis in six weeks.

Tables V. A, B, and C. Cases yielding Cultures of Tubercle Bacilli.

Table V. (A).—No Macroscopic lesions of Tuberculosis but Tubercle Bacilli obtained through the Guinea-pig.

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Tissues which produced Tuberculosis in Guinea-pigs.	Characters of Tubercle Bacilli Isolated.	Results of Guinea-pig Inoculations.
11	5	M	Typhoid fever	Cervical, bronchial, and mesenteric glands.	Eugonic from all three sources ; of low virulence for rabbits (from mesenteric and bronchial glands).	All the guinea-pigs inoculated developed tuberculosis (two from cervical glands, two from bronchial glands, and three from mesenteric glands).
14	10	M	History of ascites ; death from wasting and diarrhoea ; extreme fatty change in liver but no tuberculous lesions seen in any of the tissues.	Mesenteric glands ...	Dysgonic and of high virulence for two rabbits.	Of the three guinea-pigs inoculated with mesenteric glands, two were found healthy when killed 43 days afterwards ; the third died in 38 days and showed slight tuberculosis.
50	8	M	Morbus cordis	Mesenteric glands ...	Dysgonic and of high virulence for rabbits.	The three guinea-pigs inoculated with mesenteric glands were killed in 42 days, when each showed early general tuberculosis.
76	4	M	Anæmia	Bronchial glands	Dysgonic and of high virulence for rabbits.	Three guinea-pigs inoculated with the bronchial glands became tuberculous.
108	2	F	Fractured skull	Mesenteric glands ...	Eugonic	Two guinea-pigs were killed 48 days after inoculation with mesenteric glands. One was found to be healthy ; in the second there was general tuberculosis.

Table V. (B).—Lesions of Tuberculosis, but death attributable to other causes.

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Tissues Macroscopically Tuberculous.	Tissues yielding living Tubercle Bacilli.	Characters of Tubercle Bacilli Isolated.
8	$2\frac{1}{3}$	M	Diarrhoea ; convulsions. (No tuberculosis of intestine.)	Cervical glands enlarged and several caseous throughout (tubercle bacilli in smear). Two mesenteric glands contained minute caseous foci. Two small tubercles in spleen (a few tubercle bacilli in smear). [Bronchial glands apparently non-tuberculous.]	Bronchial glands. [Failure to recover tubercle bacilli from cervical glands, mesenteric glands, and spleen.]	Eugonic and of low virulence for rabbits.
16	$6\frac{11}{12}$	F	Morbus cordis	Six mesenteric glands were slightly enlarged and contained caseous nodules surrounded by fibrous tissue.	Mesenteric glands ...	Dysgonic and of high virulence for rabbits.
32	$6\frac{1}{2}$	F	Rheumatic fever ; morbus cordis ; pyæmia.	Several bronchial glands contained minute translucent foci. A few caseous tubercles in lungs.	Bronchial glands and one of the lung nodules.	Both eugonic ; bronchial gland culture of low virulence for rabbits.
33	10	M	Acute nephritis	Bronchial glands (some completely caseous). Grey nodules with caseous centres in both lungs (numerous tubercle bacilli in smears). Three minute caseating tubercles in the spleen.	Bronchial glands. [Failure to recover tubercle bacilli from lungs.]	Eugonic and of low virulence for rabbits.
40	9	M	Chronic enteritis... ...	Three small caseous nodules in right lung. Four bronchial glands were tuberculous.	Lungs and bronchial glands.	Both eugonic ; cultures of bronchial glands of low virulence for rabbits.
53	7	M	Congenital dilatation of colon ; operation ; peritonitis.	A gland at the root of the left lung contained a pea sized caseo-calcareous nodule. A similar nodule was found in the left lung.	Bronchial glands. [Failure to recover tubercle bacilli from lung nodules.]	Eugonic and of low virulence for a rabbit.

No. of Case.	Age in Years.	Sex.	Clinical Disease and Cause of Death.	Tissues Macroscopically Tuberculous.	Tissues yielding living Tubercle Bacilli.	Characters of Tubercle Bacilli Isolated.
60	6	F	Double infantile hemiplegia ; imbecile ; death from inanition through difficulty of feeding and swallowing.	Cervical, bronchial, and mesenteric glands were tuberculous ; two areas of tuberculous consolidation in left lung ; a few tubercles in kidneys and spleen ; intestines ulcerated.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
102	5	M	Street accident	One miliary caseo-calcareous tubercle in the lungs. One yellow, fibro-caseous miliary nodule in the mesenteric glands. [Bronchial glands apparently normal.]	Bronchial and mesenteric glands. [Failure to recover tubercle bacilli from lung nodule.]	Both eugonic and of low virulence for rabbits.
116	6	F	Middle ear disease ; meningitis.	Two calcareous nodules in one bronchial gland.	Bronchial gland ...	Eugonic and of low virulence for rabbits.
125	$6\frac{1}{2}$	M	Acute ulcerative enteritis. The large intestine showed superficial ulceration and petechial hæmorrhages. There were no tuberculous ulcers.	Caseous bronchial glands ; caseous mass in lungs and some discrete miliary tubercles ; a few miliary tubercles in spleen and liver. [Mesenteric glands apparently normal.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
132	4	F	Measles ; broncho-pneumonia.	The majority of the bronchial glands were enlarged and caseous. In the lungs were one caseous nodule and some small minute tubercles. A few tubercles in the spleen. [Mesenteric glands apparently normal.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
149	$3\frac{3}{4}$	F	Pneumonia ; meningitis...	Fibro-caseous bronchial glands ; a cavity in right lung lined by caseous substance (tubercle bacilli in smear), and numerous translucent nodules ; scattered tubercles in liver and spleen.	Bronchial glands ...	Eugonic and of low virulence for rabbits.

Table V (C).—Death attributable to Tuberculosis.

No. of Case.	Age in Years.	Sex.	Characters of Disease.	Tissues Macroscopically Tuberculous.	Tissues from which living Tubercle Bacilli were Isolated.	Characters of Tubercle Bacilli Isolated.
2	5	M.	Phthisis (10 months' history); cavitation of both lungs, general tuberculosis.	The disease was generalised	Mesenteric glands; bronchial glands; spleen.	All eugonic; cultures from mesenteric and bronchial glands of low virulence for rabbits.
3	3	F.	Tubercular dactylitis; spinal caries; pneumonia, the substance of both lungs being closely filled with caseating tubercles.	The disease was generalised	Mesenteric glands; cervical glands; lungs.	All eugonic; cultures from mesenteric glands and lungs of low virulence for rabbits.
4	$2\frac{2}{3}$	M.	Phthisis; extensive caseation of lungs; general tuberculosis.	The disease was generalised	Cervical, bronchial, and mesenteric glands.	All eugonic; cultures from mesenteric and bronchial glands of low virulence for rabbits.
6	7	F.	Tuberculous pneumonia; meningitis; lungs extensively tuberculous, with large ragged cavities; general tuberculosis.	The disease was generalised	Cervical, bronchial, and mesenteric glands.	All eugonic; cultures from mesenteric and bronchial glands of low virulence for rabbits.
17	4	F.	Diarrhœa, vomiting and abdominal pain for 6 months; dulness and harsh breath sounds over upper lobe of left lung.	The disease was generalised	Cervical, bronchial, and mesenteric glands.	All engonic; cultures from mesenteric and bronchial glands of low virulence for rabbits.

No. of Case.	Age in Years.	Sex.	Characters of Disease.	Tissues Macroscopically Tuberculous.	Tissues from which living Tubercle Bacilli were Isolated.	Characters of Tubercle Bacilli Isolated.
23	$6\frac{1}{2}$	F.	Tuberculous meningitis; clinically, no definite physical signs in chest or abdomen.	Brain; bronchial glands; a caseous nodule in left lung; several minute tubercles in spleen; one cervical gland was caseous.	Bronchial glands ...	Eugonic and of low virulence for rabbits.
26	$8\frac{1}{12}$	M.	Otorrhœa; hæmoptysis; general tuberculosis.	The disease was generalised	Cervical, bronchial, and mesenteric glands.	All eugonic; cultures from mesenteric and bronchial glands of low virulence for rabbits.
27	$2\frac{1}{4}$	F.	Tuberculous peritonitis; general tuberculosis.	The disease was generalised	Bronchial and mesenteric glands; pericardium.	All dysgonic and of high virulence for rabbits.
28	3	F.	General miliary tuberculosis; meningitis.	The disease was generalised	Bronchial and mesenteric glands.	Both eugonic; cultures from mesenteric and bronchial glands of low virulence for rabbits.
34	3	M.	General tuberculosis; meningitis.	The disease was generalised but there was only slight tuberculosis of the mesenteric glands and the intestines were not ulcerated.	Bronchial and mesenteric glands; lungs.	All eugonic; cultures from bronchial and mesenteric glands of low virulence for rabbits.
37	$2\frac{1}{2}$	F.	Abdominal tuberculosis; tuberculous broncho-pneumonia.	Intestinal ulceration; extensive tuberculosis of mesenteric glands; numerous caseous nodules in both lungs; bronchial glands slightly affected.	Bronchial and mesenteric glands.	Both dysgonic and of high virulence for rabbits.
38	9	M.	Hip disease; general tuberculosis.	The disease was generalised	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.

39	3	F.	Tuberculous meningitis...	A patch of small tubercles in upper lobe of left lung; four bronchial and four mesenteric glands were tuberculous but not much enlarged; the brain showed basal meningitis and thickening of pia mater along longitudinal fissure.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
41	3	F.	Tuberculous mesenteric glands; tuberculous meningitis.	Brain; mesenteric glands; intestine; spleen; a few minute translucent tubercles in lungs. [Bronchial glands apparently normal.]	Bronchial and mesenteric glands.	Both dysgonic and of high virulence for rabbits.
43	4	F.	Tuberculous pneumonia...	Caseous tubercles throughout both lungs and a cavity at left apex; bronchial glands extensively tuberculous; one small caseous tubercle in a mesenteric gland (tubercle bacilli in smear); a few tubercles in the kidneys.	Bronchial glands [Failure to recover tubercle bacilli from mesenteric glands.]	Eugonic; of low virulence for a rabbit.
46	10	M.	General tuberculosis ...	Miliary tuberculosis of both lungs; bronchial glands slightly affected; mesenteric glands tuberculous; intestines ulcerated; tubercles in liver and kidneys.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
47	$2\frac{3}{4}$	M.	Tuberculous peritonitis and meningitis.	Fairly numerous miliary tubercles in lungs; mesenteric glands extensively tuberculous; intestines ulcerated. [Bronchial glands apparently normal.]	Bronchial and mesenteric glands.	Both dysgonic and of high virulence for rabbits.
48	$2\frac{11}{12}$	M.	Pulmonary tuberculosis...	Both lungs closely filled with miliary tubercles becoming confluent; bronchial glands enlarged and almost wholly caseous: tubercles in mesenteric glands and spleen.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
56	$3\frac{7}{12}$	F.	Miliary tuberculosis; pneumonia; pneumothorax.	Both lungs solid with miliary tubercles; bronchial glands very large and caseous; disseminated tubercles in all abdominal organs.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.

No. of Case.	Age in Years.	Sex.	Characters of Disease.	Tissues macroscopically tuberculous.	Tissues from which living tubercle bacilli were isolated.	Characters of tubercle bacilli isolated.
59	$5\frac{2}{3}$	M.	General tuberculosis ...	The disease was disseminated	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
62	$5\frac{1}{6}$	F.	Tuberculous meningitis ...	Brain showed miliary tuberculosis of meninges; bronchial glands much enlarged and caseous; miliary tubercles in lungs, spleen, and kidneys. [Mesenteric glands apparently normal.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
70	5	M.	Abdominal and generalised tuberculosis.	The mesenteric glands formed a large caseous mass. Discrete tubercles were found throughout the body.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
71	6	F.	Tuberculous meningitis ...	Brain; bronchial glands; caseous nodules in left lung.	Bronchial glands ...	Eugonic and of low virulence for rabbits.
75	$3\frac{1}{2}$	M.	Miliary tuberculosis of lungs.	Lungs and bronchial glands extensively tuberculous; discrete tubercles in mesenteric glands, spleen, and kidneys.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
78	$3\frac{1}{4}$	F.	General tuberculosis ...	The disease was disseminated	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
79	9	M.	Tuberculous meningitis ...	A small patch of tuberculosis at apex of left lung. [Bronchial glands apparently normal.]	Lung and bronchial glands.	Both eugonic and of low virulence for rabbits.
81	4	F.	Pulmonary tuberculosis; empyæma.	Extensive caseation of lungs, with cavities; disseminated tuberculosis.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
83	$2\frac{1}{4}$	F.	Tuberculous knee joints; operation; tuberculous meningitis.	Three caseo-calcareous bronchial glands on the right side; a caseo-calcareous nodule in right lung; minute translucent tubercles scattered throughout both lungs. [Mesenteric glands apparently normal.]	Bronchial and mesenteric glands. [Failure to recover tubercle bacilli from lung nodule.]	Both eugonic and of low virulence for rabbits.
85	$5\frac{1}{4}$	M.	Tuberculous meningitis ...	Brain; four fibro-caseous bronchial glands; a few miliary tubercles in liver and spleen.	Bronchial glands, liver, and spleen.	All eugonic and of low virulence for rabbits.

86	3	F.	General tuberculosis ...	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
87	$2\frac{5}{6}$	F.	Meningitis; miliary tuberculosis.	The disease was disseminated, but no tubercles were visible in the kidneys or liver.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
89	6	F.	Phthisis; history of lupus	The lungs contained numerous tubercles, with caseous and fibrotic change; one bronchial gland contained a miliary caseo-calcareous nodule; the intestines showed tuberculous ulceration. [Mesenteric glands not visibly tuberculous.]	Lungs; bronchial glands; intestine; mesenteric glands.	All eugonic; cultures from lungs, intestine, and mesenteric glands of low virulence for rabbits.
90	3	F.	General tuberculosis; meningitis.	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
92	3	F.	General tuberculosis ...	The disease was disseminated... ...	Mesenteric glands ...	Eugonic and of low virulence for rabbits.
94	5	M.	General tuberculosis; ascites; abdominal section.	Scattered submiliary tubercles in lungs; one bronchial gland caseous; tuberculous ulcers of intestine; a few miliary tubercles of spleen.	Spleen. [Failure to recover tubercle bacilli from lungs.]	Eugonic and of low virulence for rabbits.
95	3	F.	Pulmonary tuberculosis...	The disease was disseminated... ...	Bronchial and mesenteric glands; spleen.	All eugonic; cultures from bronchial and mesenteric glands of low virulence for rabbits.
96	$2\frac{5}{6}$	M.	Tuberculous meningitis...	Meningeal lesions typical; a few grey foci in liver. [Mesenteric glands apparently normal.]	Liver and mesenteric glands.	Dysgonic and of high virulence for rabbits.
97	$6\frac{5}{6}$	F.	Pulmonary tuberculosis...	Lungs extensively caseous, with cavities; bronchial and mesenteric glands enlarged and caseous throughout; intestines ulcerated.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
99	$9\frac{3}{4}$	M.	Spinal caries; tuberculous rib, with discharging sinus; albuminuria; ascites.	Several mesenteric glands contained caseo-calcareous tubercles; the spleen contained several caseo-calcareous nodules.	Mesenteric glands. [Failure to recover tubercle bacilli from spleen.]	Dysgonic but of low virulence for rabbits.

No. of Case.	Age in Years.	Sex.	Characters of Disease.	Tissues Macroscopically Tuberculous.	Tissues from which living Tubercle Baeilli were Isolated.	Characters of Tubercle Bacilli Isolated.
100	$2\frac{1}{12}$	F.	Meningitis	Bronchial glands extensively caseous ; sparsely scattered minute tubercles in lungs and a few in spleen and kidneys.	Bronchial glands ...	Eugonic and of low virulence for rabbits.
103	6	M.	Tuberculous meningitis ...	Brain ; bronchial glands partially caseous ; scattered minute tubercles and a caseous patch in lungs ; a few minute tubercles in liver and kidneys.	Bronchial glands ...	Eugonic and of low virulence for rabbits.
105	$2\frac{3}{4}$	F.	Tabes mesenterica and tuberculous peritonitis.	A moderate number of minute caseating tubercles in the lungs ; mesenteric glands very greatly enlarged, forming a caseous mass ; a few minute tubercles in spleen and kidneys ; intestines ulcerated. [Bronchial glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both dysgonic and of high virulence for rabbits.
106	3	M.	Pulmonary tuberculosis ; pleurisy.	Lungs extensively tuberculous, with large cavities in the right ; bronchial glands caseous ; caseous tubercles in mesenteric glands, spleen and kidneys ; intestines ulcerated.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
110	$4\frac{1}{2}$	F.	Tuberculous meningitis ...	Bronchial glands enlarged and caseous ; numerous discrete tubercles in lungs and one caseous nodule ; disseminated tubercles in abdominal organs.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
112	4	M.	Meningitis	Bronchial glands caseous ; miliary tubercles in both lungs and caseous mass in right upper lobe ; miliary tubercles in spleen and kidneys. [Mesenteric glands not visibly tuberculous.]	Bronchial and mesenteric gland ; lungs.	All eugonic and of low virulence for rabbits.

115	2	F.	Meningitis; pulmonary tuberculosis.	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
118	6	M.	Meningitis; general tuberculosis.	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
120	4¼	F.	Hip disease; meningitis...	Brain; discrete tubercles in bronchial glands; miliary tuberculosis of lungs and an encapsuled nodule; miliary tubercles of spleen and kidneys. [Mesenteric glands not visibly tuberculous.]	Bronchial and mesenteric glands; lung; spleen.	All eugonic; cultures from mesenteric glands, bronchial glands, and spleen of low virulence for rabbits.
121	6	M.	Tuberculous meningitis...	Brain; some discrete tubercles seen in lungs, mesenteric glands, spleen, and liver.	Liver and spleen ...	Both dysgonic and of high virulence for rabbits.
126	5½	F.	Pulmonary and general tuberculosis.	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
128	4	F.	Tuberculous meningitis...	Brain; left lung; pericardium; two tubercles in right lung; a few small tubercles in bronchial and mesenteric glands, liver, and spleen; one recent ulcer in ileum.	Bronchial and mesenteric glands; lung.	All eugonic; cultures from bronchial and mesenteric glands of low virulence for rabbits.
130	3	M.	General tuberculosis ...	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
134	4	M.	Tuberculous meningitis...	The disease was disseminated, but the mesenteric glands were macroscopically normal.	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
136	4½	M.	Tuberculous meningitis...	Brain; some caseous nodules in right lung; a caseous nodule in one bronchial gland; superficial ulceration of Peyer's patches; a few grey tubercles in liver. [Mesenteric glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.

No. of Case.	Age in Years.	Sex.	Characters of Disease.	Tissues Macroscopically Tuberculous.	Tissues from which living Tubercle Bacilli were Isolated.	Characters of Tubercle Bacilli Isolated.
140	6	M.	Intestinal tuberculosis; perforation.	Mesenteric glands and intestine. [Bronchial glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both dysgonic and of high virulence for rabbits.
141	6	F.	Tuberculous meningitis...	Two caseous bronchial glands; miliary tubercles in both lungs and a caseous patch in left upper lobe; miliary tubercles in spleen, liver and kidneys. [Mesenteric glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
142	5	F.	Tuberculous meningitis...	Caseous bronchial glands and miliary tuberculosis of lungs, liver, and spleen. [Mesenteric glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
143	5	M.	Diabetes mellitus; pulmonary tuberculosis; pneumothorax.	Caseous bronchial glands: caseation of lungs, with cavities; discrete tubercles in liver, spleen, and kidneys.	Bronchial glands ...	Eugonic and of low virulence for rabbits.
146	5	F.	Tuberculous meningitis; general tuberculosis.	The disease was disseminated... ...	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
147	8	M.	Tuberculous meningitis...	Caseous bronchial glands; miliary tuberculosis of lungs, with a caseous patch in left upper lobe; miliary tubercles in liver, spleen, and kidneys. [Mesenteric glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.
150	$2\frac{3}{4}$	F.	Tuberculous peritonitis...	Advanced tuberculosis of mesenteric glands and small intestine; a few caseous tubercles in liver; miliary tuberculosis of lungs. [Bronchial glands not visibly tuberculous.]	Bronchial and mesenteric glands.	Both eugonic and of low virulence for rabbits.

The Bacteriological Characteristics of the Bacilli.

I.—Microscopic Appearances in Original Material.

In the course of examining the tuberculous lesions found in children, observations were recorded as to the appearances and numbers of the tubercle bacilli found in smear preparations. After the work of determining the type of bacillus by culture and animal experiment had been completed, these records were collected and analysed, with a view to determining how far it had been possible to base on microscopic appearances an accurate forecast of the type of bacillus, on the assumption that long and beaded forms were characteristic of the human type and that short and unformly stained forms, without admixture of the former, indicated the bovine type. 121 smears were recorded. In 61 the bacilli were of moderate length and showed no indication as to type; in 52 cases (47 "human" and 5 "bovine") a correct inference was drawn; in eight (6 "human" and 2 "bovine") a definite inference appeared possible but proved to be incorrect.

II.—Cultural Characters.

Tubercle bacilli were obtained in culture from 78 out of 150 children investigated. The cultures were derived mainly from the bronchial and mesenteric glands, which were always used for the purpose whenever they contained tuberculous lesions or produced tuberculosis in guinea-pigs. While the principal object of the investigation was to determine the characters of the tubercle bacilli from these glands, lesions in other parts of the body were also made use of, and cultures from these were compared with those obtained from the bronchial and mesenteric glands. The total number of cultures of which the characters were fully determined was 153. Of these, 80 were obtained direct from tuberculous lesions in 50 children; the remainder were derived through the guinea-pig.

The primary cultures were made on egg medium; the subcultures were maintained on solidified bovine serum without glycerin.

The cultures were not allowed to come in contact with any medium containing glycerin except for the purpose of testing differential characters, when transference was always made, both in the initial test and in any repetitions of the test, from a culture, grown on pure serum, from three to seven days old. Every strain was tested on glycerin-agar prepared from veal broth with the addition of 5 per cent. glycerin. As supplementary tests, veal broth, containing 5 per cent. of glycerin, and glycerinated potato were also used. Special care was taken in selecting for use the batches of these three media, none being accepted as satisfactory until it had been found to be reliable by experiment with strains of known cultural characters.

In our experience glycerin-agar is the best of the three media, provided that care is taken to obtain from each strain the best growth of which it is capable. This often involves much trouble and may occasionally necessitate many repetitions of the test. No significance can be attached to failure to produce more than a

scanty growth on a single tube. Glycerinated potato is also a reliable medium. With broth it is often very troublesome to obtain the best possible growth on transference from serum.

Emphasis must be laid on the fact that cultural characteristics, though requiring much care for their elucidation in difficult cases, can be established definitely. Reliance, however, should not be placed on one medium alone, since the risk of possible experimental error is diminished when the results are controlled by the use of the three media specified above. We refer in particular to the established fact that, though the majority of strains which are of low virulence for rabbits and cattle grow abundantly on the above differential media, with a relatively small number of such strains the idiosyncracy of being unable to produce more than a scanty growth on these media is a stable characteristic.

We found in every case that cultures obtained, either directly or through the guinea-pig, from different situations in the same body were identical in growth on the media employed.

According to differences in the rapidity and abundance of their growth on the test media, the various strains have been termed either dysgonic or eugonic. For each of these groups differences in luxuriance were observed, particularly in the dysgonic, where with some strains no more than a few discrete warty colonies were obtained on glycerin-agar and with others the surface became ultimately covered with a moderately dense layer. It was, however, unusual for the dysgonic strains to approach the eugonic very nearly in luxuriance of growth. Only two such instances occurred, H 50 and H 96, in our 13 viruses classed as belonging to the former variety. With these, growth on glycerin-agar was not as rapid as with the eugonic strains and, though it ultimately became dense, it was warty and irregular in thickness and the wrinkling on the surface was not uniform; growths on glycerinated potato and glycerin-broth were only moderately good.

The broad result, then, of our culture work was that dysgonic bacilli were obtained from 13 children and eugonic from 65.

III.—Experimental virulence for Rabbits.

In the case of each virus, weighed quantities of young serum cultures were tested on rabbits. All the rabbits used were adult, and to this fact we attribute the rarity of premature death from intercurrent disease. The growth was scraped from the surface of serum tubes and weighed on a chemical balance without drying. Two methods of infection were employed, intravenous inoculation in the ear and subcutaneous inoculation between the shoulders, a situation which is preferable to the subcutaneous tissues of the abdomen as there is less liability to ulceration. The usual dosage was either ·01 mg. intravenously or 10 mg. subcutaneously; with some of the eugonic strains these doses were exceeded.

The following results were obtained.

Twelve viruses produced in every instance death from severe general tuberculosis whilst the remaining 66 viruses exhibited a

much lower degree of virulence, sufficient to distinguish them more or less sharply from the above twelve.

We proceed to consider these results in relation to the cultural characteristics of the bacilli on differential media.

Twelve of the thirteen dysgonic viruses produced fatal general tuberculosis in every rabbit inoculated and were therefore identical with the typical tubercle bacillus of bovine origin.

The remaining dysgonic virus and all the 65 eugonic viruses were distinguishable from the above by their lower virulence.

For purpose of detailed analysis, the effects of intravenous and of subcutaneous inoculation are best considered separately.

Intravenous Method.

Six dysgonic viruses were tested by this method in nine rabbits, all of which died from general tuberculosis in from 16 to 31 days.

One dysgonic, H 99, and 30 eugonic viruses were tested in 45 rabbits. Of these, four rabbits died prematurely with only slight tuberculosis; the remainder, with three exceptions, were killed from 94 to 145 days after inoculation and showed tuberculosis of different degrees but in all cases less extensive than was caused by the above six dysgonic viruses. In the three exceptional rabbits, inoculated with cultures of H 46, H 71 and H 90 respectively, death was produced in 38, 50, and 38 days and the type of disease was practically indistinguishable from that following similar inoculation with typical bovine tubercle bacilli. Repetition experiments were made with the three original cultures and also with cultures derived from the above three rabbits, but in no instance was the disease fatal or of greater severity than we have frequently found produced by other eugonic viruses of human origin. These results show that the first three rabbits must have been of more than average susceptibility and that there was no cause to suspect an admixture of highly virulent with less virulent bacilli in the original human material. They also illustrate the need for caution in using the intravenous method for differentiating types of tubercle bacilli.

Subcutaneous Method.

Twelve dysgonic viruses were tested by this method in 27 rabbits, all of which died from tuberculosis typical of that produced by the bovine bacillus. The duration of life ranged from 26 to 81 days with one exception, where a rabbit, inoculated with less than 10 mg., survived 102 days.

One dysgonic, H 99, and the 65 eugonic viruses were tested in 133 rabbits. With seven exceptions the rabbits survived a period of 90 days and were found, on the termination of the experiments at the end of this period, to be, without exception, less extensively affected than was the case with the above twelve dysgonic viruses. The range of variation in the amount of disease produced was considerable. The characteristic feature was the softening of the local lesion, usually with the formation of a cyst; ulceration was rarely produced and the nearest glands were only occasionally and slightly affected. In the lungs the amount of disease varied from

a few small and discrete tubercles to coalescent caseous areas replacing a considerable portion of the tissue. Evidence of disease in the kidneys was commonly found, but usually appeared to be retrogressive in nature. The spleen and bronchial glands were rarely affected. On reference to Table VII. (p. 78) there will be found a description of the lesions in the more important tissues, and it will be observed that where the disease of the lungs was particularly extensive, cultures made from this organ showed no increased virulence, and, in fact, usually produced less disease when inoculated into another rabbit. As regards four rabbits (of the seven mentioned at the beginning of this paragraph), where death occurred before the lapse of 90 days, intercurrent disease was found in two; in the two others the lungs were severely affected with tuberculosis. The production of relatively slight tuberculosis in other rabbits inoculated with the same viruses as these four showed that the virulence of the strains did not approximate to the bovine type. Of the remaining three rabbits, two died in 36 and 39 days from causes other than tuberculosis; one was killed in 84 days and showed only slight tuberculosis.

The one dysgonic virus, H 99, included in this series of viruses of relatively low experimental virulence was of extremely scanty growth on glycerinated media, resembling in this respect many typical bacilli of bovine origin. It was thoroughly tested on rabbits, with results which definitely established its low pathogenicity for this animal. (*See* Table VI., pp. 76-77.) This virus was also tested, in culture, on guinea-pigs; two, inoculated with 1 mg. subcutaneously, died from general tuberculosis in 84 and 92 days; two, inoculated with 1 mg. subcutaneously died from general tuberculosis in 117 and 127 days.

Table VI.—Intravenous and Subcutaneous Experiments on Rabbits with Dysgonic Tubercle Bacilli.

No. of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.	Post-mortem Results.
		Age of Sub-culture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.		
					mg.					days.	
14	Mesenteric glands (through guinea-pig).	10	4th	44	·01	i.v.	120	2,850	1,820	D 24	General tuberculosis.
	,, ,, ,, ,,	,,	,,	,,	10	sub.	121	2,350	1,950	D 35	,, ,,
16	Mesenteric glands (through guinea-pig).	11	5th	49	·01	i.v.	136	3,210	2,000	D 25	,, ,,
	,, ,, ,, ,,	,,	,,	,,	10	sub.	137	2,160	1,790	D 39	,, ,,
27	Mesenteric gland	6	3rd	30	·01	i.v.	116	3,530	2,690	D 28	,, ,,
	Bronchial gland	18	6th	100	·01	i.v.	154	2,320	1,400	D 16	Early general tuberculosis.
	,, ,, ...	,,	,,	,,	10	sub.	155	2,200	1,700	D 37	General tuberculosis.
	Pericardium...	10	3rd	199	8	sub.	265	3,620	3,000	D 52	,, ,,
37	Mesenteric glands (through guinea-pig).	10	8th	135	10	sub.	251	2,860	1,940	D 46	,, ,,
	Bronchial gland	11	6th	99	·01	i.v.	175	2,750	2,100	D 16	Early general tuberculosis.
	,, ,, ...	,,	,,	,,	10	sub.	174	2,060	1,820	D 30	General tuberculosis.
41	Mesenteric gland	12	4th	55	·01	i.v.	141	3,440	2,250	D 30	,, ,,
	,, ,, ...	,,	,,	,,	8	sub.	142	2,420	1,800	D 102	,, ,,
	,, ,, (through guinea-pig).	7	5th	212	10	sub.	355	2,720	1,930	D 75	,, ,,
	,, ,, ,, ,,	9	8th	255	·01	i.v.	367	2,420	2,150	D 31	,, ,,
	,, ,, ,, ,,	,,	,,	,,	10	sub.	368	2,640	2,070	D 47	,, ,,
	,, ,, ,, ,,	,,	,,	,,	10	sub.	369	1,800	1,300	D 55	,, ,,
	Bronchial glands (through guinea-pig).	10	8th	136	10	sub.	268	1,760	1,700	D 30	,, ,,

No. of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.	Post-mortem Results.
		Age of Sub-culture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.		
					mg.					days.	
47	Mesenteric gland	14	7th	73	·01	i.v.	160	2 470	1,320	D 22	General tuberculosis.
	,, ,, ...	,,	,,	,,	10	sub.	161	2,230	1,770	D 36	,, ,,
	Bronchial glands (through guinea-pig).	17	6th	91	·01	i.v.	198	3,000	2,200	D 25	,, ,,
	,, ,, ,, ,,	,,	,,	,,	10	sub.	199	2,200	1,900	D 26	,, ,,
50	Mesenteric glands (through guinea-pig).	8	7th	128	10	sub.	266	2,940	1,800	D 46	Firm caseous local lesion; nearest gland caseous. Lungs beset with caseous tubercles, partly discrete and partly confluent; bronchial gland caseous. A few minute tubercles in spleen. Several caseous tubercles in kidneys. Peritoneal tuberculosis.
	,, ,, ,, ,,	,,	,,	,,	10	sub.	267	1,970	1,720	D 36	General tuberculosis.
76	Bronchial glands (through guinea-pig).	7	6th	101	10	sub.	259	1,870	1,950	D 45	,, ,,
	,, ,, ,, ,,	,,	,,	,,	10	sub.	260	1,470	1,200	D 32	,, ,,
96	Mesenteric glands (through guinea-pig).	10	3rd	66	10	sub.	216	2,560	2,020	D 55	,, ,,
	,, ,, ,, ,,	,,	,,	,,	5	sub.	223	1,140	1,150	D 35	,, ,,
	Liver (through guinea-pig) ...	10	4th	50	10	sub.	250	2,930	2,150	D 59	,, ,,
99	Mesenteric glands (through guinea-pig).	14	4th	50	·001	i.v.	252	2,280	2,100	K 104	A few small caseous foci and several discrete nodules in lungs. A few minute depressions on surface of kidneys but no tubercles. All other tissues normal.

	,, ,, ,, ,,	,,	,,	,,	10	sub.	253	1,910	1,750	K 104	Cystic local lesion. Moderately numerous discrete, caseous nodules on surface of lungs. A few minute depressions on surface of kidneys. Local glands and other tissues normal.
	,, ,, ,, ,,	6	8th	112	11	sub.	345	2,500	3,190	K 126	Cystic local lesion. A few minute tubercles in the lungs and a miliary tubercle in one kidney. Local glands and other tissues normal.
	,, ,, ,, ,,	,,	,,	,,	11	sub.	346	2,020	2,240	K 126	Cystic local lesion. Scattered miliary caseating tubercles on the surfaces of the lungs. All other tissues normal.
	,, ,, ,, ,,	6	10th	169	·01	i.v.	361	3,860	3,500	K 95	Small areas of caseation on surface and at margins of lungs ; a few small tubercles in kidneys ; no other disease.
	,, ,, ,, ,,	,,	,,	,,	·01	i.v.	362	2,710	3,200	K 95	Small areas of caseation on surface and at margins of lungs ; no other disease.
	,, ,, (rabbit 252) ...	7	4th	54	12	sub.	373	3,320	3,350	K 105	Caseous local lesion. A few minute tubercles in lungs and two in kidney ; otherwise normal.
105	Mesenteric gland	17	5th	100	10	sub.	254	2,030	1,690	D 55	General tuberculosis.
	,, ,, ...	,,	,,	,,	10	sub.	255	1,980	1,444	D 43	,, ,,
	Bronchial glands (through guinea-pig).	11	5th	86	10	sub.	271	3,200	2,400	D 47	,, ,,
121	Liver (through guinea-pig) ...	10	4th	54	10	sub.	301	1,950	1,170	D 49	,, ,,
	Spleen (through guinea-pig) ...	10	4th	54	10	sub.	302	2,170	1,550	D 46	,, ,,
140	Mesenteric glands (through guinea-pig).	10	4th	50	10	sub.	319	2,320	1,700	D 54	,, ,,
	Bronchial glands (through guinea-pig).	9	4th	37	10	sub.	329	2,750	1,820	D 81	,, ,,

TABLE

Intravenous and subcutaneous experiments

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number ef Rabbit.	Weights of of Rabbits in grammes.		Duration of Experiments.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial	Final.	
					mg.					days.
2	Mesenteric gland...	7	5th	64	·1	i.v.	92	2,160	2,300	K 98
	Bronchial gland ...	8	5th	269	15	sub.	209	2,150	2,500	K 104
3	Mesenteric gland...	7	5th	57	·1	i.v.	93	1,770	2,460	K 98
	Lung (through rabbit).	5	2nd	20	·01	i.v.	115	2,350	1,900	K 115
	„ (rabbit 115)	7	3rd	41	10	sub.	324	1,210	2,000	K 105
4	Mesenteric gland...	7	7th	72	·1	i.v.	101	2,250	2,320	K 94
	Bronchial gland ...	7	6th	260	16	sub.	203	3,440	2,980	K 104
6	Mesenteric gland...	15	3rd	45	·1	i.v.	99	3,370	2,410	K 98
	Bronchial gland ...	11	4th	245	11	sub.	235	1,940	1,220	D 92
	Cervical gland ...	11	3rd	245	11	sub.	236	1,720	1,970	K 104
8	Bronchial glands (through guinea-pig).	12	2nd	31	10	sub.	114	2,320	2,820	K 100
	Bronchial glands (rabbit 114).	10	5th	118	10	sub.	341	3,720	3,550	K 105
	Bronchial glands (rabbit 341).	6	3rd	27	10	sub.	377	2,110	2,850	K 84
11	Mesenteric glands (through guinea-pig).	7	4th	38	·01	i.v.	117	1,950	2,370	K 106
	Bronchial glands (through guinea-pig).	8	6th	174	17	sub.	212	2,920	2,770	K 104
17	Mesenteric glands (through guinea-pig).	4	4th	45	·01	i.v.	132	3,150	3,400	K 113
	„ „	7	4th	48	18	sub.	133	3,130	2,650	K 113
	Bronchial gland ...	7	4th	208	18	sub.	205	2,820	3,090	K 104
23	Bronchial glands (through guinea-pig).	14	6th	151	·01	i.v.	242	2,800	3,000	K 104
	„ „	„	„	„	10	sub.	243	1,820	1,950	K 104
26	Mesenteric gland...	7	4th	45	·01	i.v.	118	1,790	2,570	K 106
	Bronchial gland ...	8	7th	192	15	sub.	241	1,950	2,800	K 104

VII.

on Rabbits with Eugonic Tubercle Bacilli.

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
—	—	A moderate number of nodules; several large.	Nil	Nil	Scattered miliary tubercles.
Cystic	Nil	A few tubercles	Nil	Nil	Nil.
—	—	Scattered submiliary tubercles.	Nil	Nil	Nil.
—	—	Numerous nodules ...	Soft nodule.	Few small tubercles.	A few tubercles.
Cystic	One caseous.	Three tubercles; caseation of margins.	Nil	Nil	Nil.
—	—	Moderately numerous nodules.	Soft nodules.	Nil	A few pits and tubercles.
Cystic	Caseous	A few gritty nodules and a caseous patch.	Nil	Nil	A few grey foci; pus in pelvis.
—	—	Enlarged; caseation of surfaces.	Nil	Nil	A few nodules; pus in pelvis.
Small and soft.	Nil	A few minute tubercles	Nil	Nil	Nil.
Cystic	Nil	A moderate number of nodules.	Nil	Nil	Nil.
Cystic	Nil	A moderate number of nodules; marginal nodules.	Nil	Nil	A few miliary tubercles.
Cystic	Nil	Enlarged, firm, almost entirely replaced by caseous tissue.	Nil	Nil	A few yellow tubercles.
Cystic	Cystic nodules	Small grey tubercles ...	Nil	Nil	Nil.
—	—	Scattered nodules ...	Nil	Nil	One tubercle.
Cystic	Nil	Six miliary tubercles ...	Nil	Nil	One tubercle.
—	—	Scattered tubercles and caseous nodules.	Nil	Nil	A few depressions on surface.
Cystic	Caseous	A few nodules	Nil	Nil	Nil.
Cystic	Nil	Three tubercles	Nil	Nil	Nil.
—	—	A few tubercles and nodules.	Nil	Nil	Nil.
Cystic	Nil	A few nodules	Nil	Nil	Nil.
—	—	Closely studded with semi-confluent nodules.	Nil	Nil	Surface pitted: a few tubercles.
Small soft nodule.	Nil	Eight tubercles	Nil	Nil	Nil.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiments.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
28	Mesenteric gland...	7	3rd	36	·01	i.v.	119	2,150	2,220	K 106
	Bronchial gland ...	9	7th	260	11	sub.	296	2,680	3,050	K 105
32	Bronchial glands (through guinea-pig).	4	4th	28	·01	i.v.	143	3,520	2,800	D 86
	,, ,,	,,	,,	,,	10	sub.	144	2,850	2,670	K 105
	Bronchial glands (rabbit 144).	7	3rd	33	11	sub.	321	1,060	1,120	K 105
33	Bronchial glands (through guinea-pig).	18	3rd	45	·01	i.v.	156	2,330	2,270	K 106
	,, ,,	,,	,,	,,	24	sub.	157	2,960	2,720	K 106
34	Mesenteric glands (through guinea-pig).	4	7th	129	11	sub.	229	2,500	3,050	K 104
	Bronchial gland ...	4	5th	49	·01	i.v.	126	3,120	2,600	K 103
	,, ,,	,,	,,	,,	14	sub.	127	3,300	3,000	K 103
38	Mesenteric glands (through guinea-pig).	11	4th	56	·01	i.v.	173	2,130	1,620	K 105
	,, ,,	,,	,,	,,	40	sub.	172	1,960	2,570	K 105
	Bronchial gland ...	7	5th	163	16	sub.	204	2,770	3,120	K 104
39	Mesenteric glands (through guinea-pig).	9	3rd	39	·01	i.v.	164	2,020	2,320	K 105
	,, ,,	,,	,,	,,	14	sub.	165	1,750	2,270	K 105
	Bronchial glands (through guinea-pig).	15	4th	123	11	sub.	232	2,000	2,250	K 104
40	,, ,,	8	3rd	37	·01	i.v.	158	2,700	2,520	K 106
	,, ,,	,,	,,	,,	24	sub.	159	1,800	1,950	K 106
43	,, ,,	11	4th	47	15	sub.	170	2,530	3,050	K 105
46	Mesenteric gland...	4	4th	37	·01	i.v.	128	2,100	1,470	D 38
	,, ,, ...	,,	,,	,,	15	sub.	129	2,050	1,870	K 137
	,, ,, ...	22	3rd	123	·01	i.v.	200	1,930	2,170	K 105

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
—	—	Enlarged; anterior portions caseous throughout; the posterior filled with semi-confluent nodules.	Nil	Nil	Moderately numerous minute tubercles.
Cystic	Nil	Several discrete caseous nodules.	Nil	Nil	Two tubercles.
—	—	Scattered tuberculous nodules; pneumonia (coccal).	Caseous foci.	Nil	A few grey foci.
Cystic	Caseous focus.	Enlarged; dorsal aspect composed of caseous tissue; discrete caseous nodules on ventral aspect.	Nil	Nil	A few tubercles; pus in pelvis.
Cystic	Nil	Several discrete grey tubercles.	Nil	Nil	Two minute tubercles.
—	—	Confluent caseous areas and scattered nodules.	Nil	Nil	One tubercle.
Soft and nodular.	Caseous	A few minute caseous tubercles.	Nil	Nil	One tubercle.
Cystic	Nil	A few tubercles and nodules.	Nil	Nil	Nil.
—	—	Caseous network on dorsal aspect; scattered caseous patches.	Nil	Nil	Surface pitted: a few tubercles.
Cystic	Nil	A few nodules	Nil	Nil	Nil.
—	—	Moderately numerous nodules.	Caseous foci.	One opaque focus.	Caseous foci and streaks; one caseous pelvis.
Soft and nodular.	Nil	Sparsely scattered tubercles.	Nil	Nil	Nil.
Cystic	Nil	Fairly numerous grey nodules.	Caseous nodule.	Nil	A few tubercles and pits.
—	—	Solid areas of caseation and numerous nodules.	Nil	Nil	A few minute tubercles.
Cystic	Nil	Scattered caseous nodules	Nil	Nil	A few tubercles.
Cystic	Nil	A few miliary tubercles	Nil	Nil	One tubercle.
—	—	Numerous nodules ...	Nil	Nil	One tubercle.
Soft and nodular.	Cystic nodule.	Scanty nodules and a caseous patch.	Nil	Nil	One tubercle.
Cystic	Nil	One tubercle	Nil	Nil	Nil.
—	—	Enlarged and solid; filled with confluent caseating nodules.	Caseous nodules.	Several grey foci.	Moderately numerous foci and tubercles.
Cystic	Cystic nodule.	A moderate number of softening nodules.	Nil	Nil	Five tubercles.
—	—	Numerous nodules ...	Nil	Three yellow foci.	Scattered grey tubercles.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
46	Mesenteric gland...	22	3rd	123	·01	i.v.	201	1,940	1,970	K 105
cont.	,, ,, ...	,,	,,	,,	·01	i.v.	202	2,000	2,300	K 105
	Mesenteric glands (rabbit (128).	16	4th	102	12	sub.	270	2,250	3,000	K 105
	Bronchial glands (through guinea-pig).	25	6th	73	·01	i.v.	195	2,120	2,300	K 106
	,, ,,	,,	,,	,,	20	sub.	196	1,540	1,850	K 106
48	Mesenteric gland...	4	4th	35	·01	i.v.	130	2,570	2,320	K 103
	,, ,, ...	,,	,,	,,	15	sub.	131	2,570	3,000	K 103
	Bronchial gland ...	12	5th	162	10	sub.	238	1,900	2,570	K 104
53	Bronchial glands (through guinea-pig).	25	3rd	70	20	sub.	197	2,900	2,950	K 106
56	Mesenteric gland...	7	4th	33	·01	i.v.	134	3,130	2,650	K 106
	,, ,, ...	,,	,,	,,	10	sub.	135	2,330	2,150	K 106
	Mesenteric glands (rabbit 135).	22	7th	105	11	sub.	359	3,070	3,250	K 105
	Bronchial gland ...	5	4th	146	12	sub.	226	2,700	2,540	K 104
59	Mesenteric gland...	13	4th	62	·01	i.v.	150	2,470	2,120	K 107
	,, ,, ...	,,	,,	,,	39	sub.	151	2,100	1,800	K 107
	Bronchial gland ...	12	3rd	153	10	sub.	245	2,360	2,790	K 104
60	Mesenteric gland...	7	3rd	60	·01	i.v.	152	2,200	2,340	K 107
	,, ,, ...	,,	,,	,,	34	sub.	153	1,860	1,840	K 107
	Bronchial gland ...	9	6th	151	11	sub.	247	1,930	2,170	K 104
62	Mesenteric glands (through guinea-pig).	8	5th	92	19	sub.	206	2,200	1,600	K 104
	Bronchial gland ...	11	3rd	44	·01	i.v.	145	3,050	2,750	K 106
	,, ,, ...	,,	,,	,,	10	sub.	146	1,555	1,700	K 106

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
—	—	Numerous nodules ...	Nil	Nil	A few tubercles
—	—	Numerous large nodules	Nil	Nil	A few tubercles.
Cystic	Nil	Several nodules	Nil	Nil	Nil.
—	—	Partly solidified with coalescent caseous areas.	Nil	Nil	A few caseous foci.
Cystic	Nil	A network of caseous nodules.	Nil	Nil	Two grey foci.
—	—	Surfaces replaced by caseous network.	Nil	One grey tubercle.	A few tubercles and caseous streaks.
Cystic	Nil	A few minute tubercles with opaque centres.	Nil	Nil	One tubercle.
Cystic	Nil	Sparse miliary gritty caseous tubercles.	Nil	Nil	Nil.
Cystic	Nil	Numerous small caseous tubercles.	Nil	Nil	A few grey tubercles.
—	—	Surfaces partially replaced by caseous network.	Nil	Nil	Scattered tubercles and a few caseous streaks.
Cystic	Nil	Partially replaced by caseous network.	Nil	Nil	Caseation of one pelvis.
Cystic : ulcer.	Nil	A few minute tubercles ...	Nil	Nil	Nil.
Soft tumour.	Nil	Numerous discrete and partially confluent nodules.	Nil	Nil	Nil.
—	—	A few tubercles	Nil	Nil	One tubercle ; caseation of one pelvis.
Softening nodules.	Caseous	Two tubercles	Nil	Nil	Nil.
Cystic	Nil	Scattered nodules ; the largest softening.	Nil	Nil	One grey nodule.
—	—	A few nodules on surface and in margins.	Nil	Nil	A few tubercles and one caseous streak.
Cystic	Nil	A few tubercles and nodules.	Nil	Nil	Nil.
Cystic	Nil	Surfaces partially replaced by softening caseous nodules.	Nil	Nil	Nil.
Cystic	Caseous	A moderate number of nodules, some gritty.	Nil	Nil	Nil.
—	—	Confluent caseous nodules on surface ; anterior lobes solid.	Caseous patch.	Nil	One caseous streak ; caseation of pelvis.
Cystic	Nil	Scattered caseating nodules.	Nil	Nil	Nil.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
62 *cont.*	Bronchial glands (rabbit 146).	11	2nd	25	13	sub.	322	1,220	1,900	K 105
70	Mesenteric gland...	6	3rd	32	·01	i.v.	139	2,850	3,200	K 107
	Bronchial glands (through guinea-pig).	6	7th	110	13	sub.	215	4,210	3,700	K 105
71	,, ,,	11	3rd	31	40	sub.	168	1,550	1,800	K 105
	,, ,,	,,	,,	,,	·01	i.v.	169	2,400	1,570	D 50
	,, ,,	10	6th	93	·001	i.v.	222	3,180	1,650	D 35
	,, ,,	,,	,,	,,	·0001	i.v.	221	2,000	1,820	K 105
	Bronchial glands (rabbit 169).	9	2nd	35	10	sub.	261	980	1,820	K 109
75	Mesenteric gland...	9	3rd	30	·01	i.v.	147	3,350	2,420	K 106
	,, ,, ...	,,	,,	,,	10	sub.	148	3,330	2,800	K 106
	Mesenteric glands (rabbit 147).	22	4th	89	10	sub.	360	2,570	2,450	D 79
	Bronchial gland ...	6	4th	122	17	sub.	208	2,700	2,770	K 103
78	Mesenteric gland...	7	5th	114	11	sub.	213	2,270	2,350	K 104
	Bronchial gland ...	7	5th	114	14	sub.	214	1,970	2,030	K 104
79	Bronchial glands (through guinea-pig).	9	3rd	78	11	sub.	246	2,980	2,840	K 104
	Lung (through guinea-pig).	18	3rd	112	12	sub.	298	1,180	2,100	K 105
81	Mesenteric glands (through guinea-pig).	10	6th	93	11	sub.	249	3,350	3,120	K 104
	Bronchial glands (through guinea-pig).	5	6th	82	15	sub.	225	2,500	2,550	K 104
83	Mesenteric glands (through guinea-pig).	10	4th	74	11	sub.	231	2,650	2,200	D 80

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
Cystic	Nil	Some small tubercles and slight caseation of margins.	Nil	Nil	Nil.
—	—	A few tubercles and marginal nodules.	Nil	Nil	Surfaces pitted: a few miliary nodules; pus in pelvis.
Soft tumour.	Nil	Surfaces partly solid and caseous.	Nil	Nil	One tubercle.
Soft caesous nodules.	Soft caseous nodules.	A few tubercles and nodules.	Nil	Nil	Caseous focus and streak.
—	—	Enlarged; filled with confluent caseous nodules.	Nil	Numerous grey foci.	Numerous grey tubercles.
—	—	Crepitant, but contained moderately numerous caseating nodules.	Caseous tubercles.	Minute tubercles.	Scattered caseous foci.
—	—	Coalescent caseous areas on surface.	Nil	Nil	Nil.
Cystic	Nil	A few minute tubercles and grey nodules.	Nil	Nil	A few depressions and fibrous scars on surface.
—	—	Surfaces replaced by by caseating tissue.	Nil	Nil	A few tubercles and streaks.
Cystic	Nil	Surfaces almost replaced by confluent caseating nodules.	Nil	Nil	One minute tubercle.
*Caseous ulcer.	Nil	Network of grey tissue beset with caseous foci.	Nil	Nil	Few depressions and minute tubercles.
A soft nodule.	Nil	Two nodules	Nil	Nil	A caseous focus.
Cystic	Nil	Few tubercles	Nil	Nil	Nil.
Cystic	Nil	A few tubercles	Nil	Nil	One tubercle.
Cystic	Nil	Numerous nodules; some softening.	Nil	Nil	Nil.
Cystic	Nil	A few small caseous tubercles.	Nil	Nil	Nil.
Cystic	Nil	Numerous nodules, large on dorsal surfaces and in margins.	Nil	Nil	Nil.
Cystic	Nil	Three tubercles	Nil	Nil	Nil.
Cystic	Nil	Enlarged, solid, and almost completely caseous. (An emulsion was inoculated into a second rabbit and produced only slight disease.)	Nil	Nil	Minute depressions on surface.

* Death from haemorrhage.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
83 *cont.*	Mesenteric glands (through guinea-pig).	12	6th	169	11	sub.	357	2,420	2,550	K 105
	Mesenteric glands (rabbit 231).	6	3rd	45	10	sub.	364	2,320	2,670	K 95
	Bronchial glands (through guinea-pig).	8	4th	66	15	sub.	230	1,840	2,770	K 104
85	„ „	8	6th	84	10	sub.	239	1,650	1,830	K 104
	Liver (through guinea-pig).	14	3rd	70	11	sub.	234	1,440	1,840	K 104
	Spleen (through guinea-pig).	8	3rd	77	10	sub.	233	1,630	1,770	K 104
86	Mesenteric gland...	8	5th	50	·01	i.v.	187	3,110	2,120	D 84
	„ „ ...	„	„	„	15	sub.	188	3,410	3,000	K 109
	Bronchial gland ...	6	4th	101	16	sub.	207	2,630	2,840	K 104
87	Mesenteric gland...	8	6th	113	10	sub.	237	1,750	2,600	K 104
	Bronchial gland ...	9	6th	102	14	sub.	211	1,890	2,100	K 104
89	Mesenteric glands (through guinea-pig).	18	2nd	35	10	sub.	191	2,470	2,500	K 106
	Bronchial glands (through guinea-pig).	18	2nd	74	10	sub.	192	1,850	1,640	D 39
	Lung (through guinea-pig).	8	4th	61	12	sub.	228	1,280	1,720	K 104
	Intestinal nodule...	8	5th	103	18	sub.	224	2,600	2,600	K 105
90	Mesenteric gland...	8	3rd	48	15	sub.	186	2,200	2,600	K 109
	„ „ ...	„	„	„	·01	i.v.	185	3,550	2,750	D 38
	„ „ ...	10	6th	103	001	i.v.	220	2,700	2,450	K 105
	„ „ ...	„	„	„	·0001	i.v.	219	3,430	2,550	K 105
	Mesenteric glands (rabbit 185).	16	2nd	41	10	sub.	287	1,970	2,790	K 104
	Bronchial glands (through guinea-pig).	5	4th	67	17	sub.	227	3,800	3,070	D 67
92	Mesenteric gland...	7	4th	35	·01	i.v.	178	2,920	2,570	K 106

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
Soft, caseous.	Caseous nodule.	A few caseous nodules ...	Nil	Nil	Nil.
Soft, caseous.	Nil	Several small, discrete, caseous tubercles.	Nil	Nil	Minute depressions on surface.
Cystic	Nil	Four tubercles	Nil	Nil	Nil.
Cystic	Nil	A few nodules and caseous patches.	Nil	Nil	Nil.
Small caseous nodule.	Nil	A few minute tubercles...	Nil	Nil	Nil.
Cystic	Nil	A moderate number of nodules, some softening.	Nil	Nil	Nil.
—	—	A moderate number of nodules; marginal caseation.	Nil	Nil	A few tubercles.
Cystic	Caseous focus.	Scattered nodules ...	Nil	Nil	A few tubercles.
Cystic	Nil	A few tubercles	Nil	Nil	Few depressions on surface.
Cystic	Nil	A few minute tubercles...	Nil	Nil	Nil.
Cystic	Nil	A few tubercles	Nil	Nil	One tubercle.
Cystic	Nil	Surfaces replaced by layer of caseous tissue.	Nil	Nil	Several tubercles.
Soft, caseous.	Nil	Non-tuberculous pneumonia.	Nil	Nil	Nil.
Cystic	Nil	Several tubercles ...	Nil	Nil	Nil.
Cystic	Nil	Moderately numerous nodules.	Nil	Nil	Two tubercles and a scar.
Cystic	Caseous	A few minute tubercles...	Nil	Nil	Minute depressions on surface.
—	—	Enlarged, solid and caseous	Caseous	Numerous minute tubercles.	A few small grey tubercles.
—	—	A few tubercles	Nil	Nil	Nil.
—	—	Numerous coalescing caseous areas.	Nil	Nil	Three tubercles.
Cystic	Nil	Several small tubercles; caseous margins.	Nil	Nil	Three tubercles.
Cystic	Nil	Numerous caseous tubercles; caseous margins. Purulent pleurisy.	Nil	Nil	One tubercle.
—	—	Moderately numerous tubercles; caseous margins.	Nil	Nil	One tubercle.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
92 *cont.*	Mesenteric gland...	7	4th	35	20	sub.	179	2,700	1,940	K 106
94	Spleen (through guinea-pig).	19	4th	49	·01	i.v.	162	2,570	2,450	K 105
	,, ,,	,,	,,	,,	13	sub.	163	1,840	2,270	K 105
95	Mesenteric glands (through guinea-pig).	12	5th	102	10	sub.	240	1,920	2,650	K 104
	Bronchial gland ...	7	7th	134	11	sub.	210	2,470	2,370	K 104
97	Mesenteric gland...	21	3rd	55	20	sub.	189	3,120	3,000	K 106
	Bronchial gland ...	21	3rd	55	20	sub.	190	2,650	2,450	K 106
100	,, ,, ...	17	4th	53	·01	i.v.	193	2,700	1,950	D 64
	,, ,, ...	,,,	,,		10	sub.	194	2,000	2,070	K 106
102	Mesenteric glands (through guinea-pig).	11	3rd	54	13	sub.	273	1,620	1,300	K 105
	Mesenteric glands (rabbit 273).	5	3rd	42	12	sub.	371	3,010	2,820	K 105
	Bronchial glands (through guinea-pig).	11	3rd	73	10	sub.	274	1,750	2,070	K 105
103	Bronchial gland ...	6	6th	113	12	sub.	279	1,920	2,000	K 104
	,, ,, ...	9	10th	227	10	sub.	365	3,650	3,820	K 116
	,, ,, ...	,,	,,	,,	·01	i.v.	366	2,190	2,670	K 116
106	Mesenteric glands (through guinea-pig).	13	4th	115	10	sub.	284	2,000	1,920	K 104
	Mesenteric glands (rabbit 284).	5	3rd	41	12	sub.	370	2,720	2,870	K 105
	Bronchial gland ...	11	4th	113	10	sub.	283	2,050	2,300	K 104
108	Mesenteric glands (through guinea-pig).	6	7th	84	10	sub.	334	2,900	2,650	K 105
	,, ,,	,,	,,	,,	·01	i.v.	335	2,250	2,300	K 105
110	,, ,,	7	4th	59	11	sub.	288	2,020	2,770	K 104
	Bronchial gland ...	9	6th	115	10	sub.	308	2,360	2,700	K 104
112	Mesenteric glands (through guinea-pig).	9	5th	90	17	sub.	307	1,850	2,070	K 104

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
Cystic	Nil	A few nodules	Nil	Three opaque foci.	Nil.
—	—	Surfaces almost replaced by caseous tissue.	Nil	Nil	A few tubercles and caseous streaks.
Cystic	Nil	A moderate number of nodules.	Nil	Nil	One tubercle.
Cystic	Caseous	A few tubercles and marginal nodules.	Nil	Nil	Nil.
Cystic	Nil	Numerous tubercles and nodules.	Nil	Nil	Depressions, scars and caseous streaks.
A soft nodule.	Nil	Fairly extensive dorsal and marginal nodules.	Nil	Nil	One tubercle.
A small nodule.	Nil	Marginal and dorsal nodules, the latter softening.	Nil	Nil	Two tubercles
—	—	Small discrete, caseous nodules.	Caseous foci.	Nil	Nil.
Cystic, small.	Nil	Nil	Nil	Nil	Nil.
Soft, caseous nodules.	Watery cyst.	Surfaces replaced by caseous network; right lung partially solid.	Nil	Nil	Several miliary tubercles.
Caseous nodule.	Nil	A few marginal nodules and scattered tubercles.	Nil	Eight, submiliary tubercles.	Five softening nodules.
Cystic	Nil	Numerous nodules and caseous patches, partially confluent on surface.	Nil	Nil	Nil.
Cystic, small.	Nil	Several discrete tubercles	Nil	Nil	A few minute tubercles.
Cystic	Nil	A few grey tubercles ...	Nil	Nil	Small depressions.
—	—	Several grey tubercles ...	Nil	Nil	Nil.
Caseous nodules, softening in centre.	Caseous	Surfaces replaced by caseous material penetrating some distance into substance.	Nil	Nil	Three tubercles.
Cystic	Nil	A few small grey tubercles.	Nil	Nil	Nil.
Caseous, soft.	Nil	A few tubercles and slight caseation of margins.	Nil	Nil	One tubercle.
Cystic	Nil	Some discrete tubercles and patches of caseation.	Nil	Nil	Two minute tubercles.
—	—	Numerous discrete tubercles.	Nil	Nil	Two small tubercles.
Cystic	Nil	A few small grey tubercles	Nil	Nil	Nil.
Cystic	Nil	Several small tubercles; margins slightly caseous.	Nil	Nil	Nil.
Ulcer	Nil	One caseous nodule and a few small grey foci.	Nil	Nil	Nil

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
112 *cont.*	Bronchial gland ...	11	3rd	74	10	sub.	269	1,870	2,370	K 105
115	Mesenteric gland...	10	5th	112	10	sub.	314	1,760	1,850	K 104
	Bronchial gland ...	10	5th	112	13	sub.	313	2,580	2,400	K 104
116	Bronchial glands (through guinea-pig).	12	4th	80	11	sub.	277	1,900	1,650	K 104
	,, ,,	,,	,,	,,	11	sub.	278	1,620	1,600	K 104
	Bronchial glands (rabbit 277).	5	3rd	41	11	sub.	372	1,870	2,070	K 105
118	Mesenteric gland...	9	5th	114	11	sub.	331	2,350	2,500	K 105
	Bronchial gland ...	9	6th	114	11	sub.	330	2,220	2,450	K 105
120	Mesenteric glands (through guinea-pig).	10	6th	84	·001	i.v.	339	2,400	1,750	K 105
	,, ,,	,,	,,	,,	10	sub.	340	2,100	2,350	K 105
	Bronchial glands (through guinea-pig).	10	4th	84	14	sub.	338	2,250	1,900	K 105
	Spleen	10	6th	127	13	sub.	337	2,520	2,620	K 105
125	Mesenteric glands (through guinea-pig).	9	4th	51	12	sub.	306	2,270	1,900	K 104
	Bronchial gland ...	7	5th	86	11	sub.	290	1,770	2,350	K 104
126	Mesenteric gland...	10	3rd	88	16	sub.	299	2,170	2,800	K 105
	Bronchial gland ...	10	5th	88	12	sub.	300	2,580	2,700	K 105
128	Mesenteric glands (through guinea-pig).	16	3rd	45	10	sub.	282	1,750	1,800	K 104
	Bronchial glands (through guinea-pig).	5	4th	47	10	sub.	281	2,300	1,900	K 104
130	Mesenteric gland...	9	5th	84	10	sub.	312	1,936	1,920	K 104
	Bronchial gland ...	9	6th	84	10	sub.	311	2,480	2,700	K 104

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
Cystic	Nil	Three discrete tubercles ; slight caseation in margin.	Nil	Nil	Nil.
Cystic	Nil	A few small grey tubercles	Nil	Nil	Nil.
Cystic	Nil	Not much enlarged but extensively caseous, leaving only small patches of crepitant tissue in interior.	Nil	Nil	Four tubercles.
Cystic	Nil	Extensively caseous ; little crepitant tissue left.	Nil	Nil	Nil.
Cystic	Nil	Extensive caseation on surface ; interior mostly crepitant.	Nil	Nil	Nil.
Cystic	Nil	Several minute tubercles	Nil	Nil	Nil.
Cystic	Nil	Fairly numerous discrete tubercles.	Nil	Nil	Nil.
Cystic	Nil	A few minute tubercles...	Nil	Nil	Nil.
—	—	Numerous caseous tubercles and patches.	Nil	Nil	Many grey tubercles.
Cystic	Nil	A few discrete grey tubercles.	Nil	Nil	Nil.
Cystic	Watery cyst	Thickly beset with discrete and semi-confluent caseating tubercles.	Nil	Nil	Two tubercles.
Cystic	Caseous	Caseous substance occupying three-fourths of surface and penetrating considerable distance into interior.	Nil	Nil	Nil.
Caseous, soft.	Nil	Numerous small grey tubercles.	Nil	Nil	One tubercle.
Cystic	Caseous	A few small grey tubercles	Nil	Nil	Nil.
Cystic	Nil	Discrete grey tubercles ; margins caseous.	Nil	Nil	Nil.
Caseous, partially cystic.	Caseous	Surfaces largely replaced by caseous layer, not penetrating far into substance.	Nil	Nil	Nil.
Cystic	Nil	Several small grey tubercles.	Nil	Nil	Nil.
Cystic	Cystic	A few shotty caseous nodules.	Nil	Nil	One minute tubercle.
Cystic	Nil	Several shotty tubercles...	Nil	Nil	Nil.
Cystic	Nil	A few caseous nodules ...	Nil	Nil	Nil.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
132	Mesenteric glands (through guinea-pig).	9	5th	47	13	sub.	328	1,750	2,050	K 105
	Bronchial glands (through guinea-pig).	7	4th	45	14	sub.	291	2,000	2,820	K 104
134	Mesenteric glands (through guinea-pig).	8	4th	53	10	sub.	295	1,890	2,420	K 104
	Bronchial gland ...	6	5th	77	11	sub.	294	1,670	1,670	K 104
136	Mesenteric glands (through guinea-pig).	6	5th	37	14	sub.	317	2,120	1,820	K 104
	Bronchial glands (through guinea-pig).	10	4th	37	14	sub.	318	1,900	1,900	K 104
141	Mesenteric glands (through guinea-pig).	8	4th	38	10	sub.	289	1,950	2,190	K 104
	Bronchial gland ...	9	6th	80	14	sub.	326	3,500	2,650	K 105
142	Mesenteric glands (through guinea-pig).	9	4th	36	10	sub.	327	2,220	2,450	K 105
	Bronchial gland ...	5	4th	64	10	sub.	275	3,100	2,600	K 104
	,, ,, ...	,,	,,	,,	10	sub.	276	1,900	1,750	K 104
143	,, ,, ...	17	4th	64	12	sub.	292	1,850	1,150	D 74
	,, ,, ...	,,	,,	,,	12	sub.	293	1,990	2,370	K 104
146	Mesenteric glands (through guinea-pig).	5	4th	38	15	sub.	309	2,000	2,120	K 104
	Bronchial glands (through guinea-pig).	5	4th	27	11	sub.	310	1,980	1,100	D 36
	,, ,,	22	8th	95	10	sub.	356	1,950	2,740	K 105
147	Mesenteric glands (through guinea-pig).	10	3rd	47	13	sub.	332	1,820	2,250	K 105

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
Cystic	Nil	Three minute tubercles...	Nil	Nil	Nil
Cystic, small.	Nil	A few minute grey tubercles and one caseous nodule.	Nil	Nil	Nil.
Cystic	Nil	Nil	Nil	Nil	Nil.
Cystic	Nil	A few discrete shotty tubercles.	Nil	Nil	Nil.
Ulcer	Caseous	Three minute grey tubercles.	Nil	Nil	Nil.
Cystic	Nil	Numerous discrete shotty tubercles.	Nil	Nil	Nil.
Cystic, small.	Nil	A few minute tubercles; margins slightly caseous.	Nil	Nil	Nil.
Cystic	Nil	Several tubercles; superficial caseation of surfaces.	Nil	Nil	Nil.
Cystic	Nil	A few minute tubercles...	Nil	Nil	One minute tubercle.
Small, soft, caseous nodules.	Nil	One minute tubercle ...	Nil	Nil	Nil.
Small, soft, caseous nodules.	Caseous	Several caseous tubercles and nodules.	Caseous foci.	Three minute tubercles.	A few tubercles and nodules.
Cystic	Nil	Extensive confluent, caseous nodules; crepitant but congested lung tissue internally.	Nil	Nil	A few caseous foci and streaks.
Cystic, small.	Nil	Numerous grey tubercles; margins caseous.	Nil	Nil	One minute tubercle.
Cystic	Caseous	A few small shotty tubercles.	Nil	Nil	Nil.
Small, caseous, softening.	Caseous	Moderately numerous discrete caseous tubercles; majority of tissue crepitant.	Caseous foci.	Nil	Nil.
Cystic	Nil	Numerous grey nodules beset with caseous foci and patches.	Nil	Nil	Three miliary tubercles.
Cystic	Nil	Numerous small discrete tubercles.	Nil	Nil	Nil.

Number of case.	Source of Cultures.	Details of Cultures.			Dose.	Mode of Inoculation.	Number of Rabbit.	Weights of Rabbits in grammes.		Duration of Experiment.
		Age of Subculture in days.	Generation.	Total duration of Cultivation in days.				Initial.	Final.	
					mg.					days.
147	Bronchial gland ...	10	3rd	76	15	sub.	333	2,170	2,070	K 105
cont. 149	„ „ ...	6	5th	70	·01	i.v.	316	2,070	1,870	K 104
	„ „ ...	5	7th	103	10	sub.	343	1,800	2,000	K 105
150	Mesenteric gland...	16	4th	58	10	sub.	285	2,050	1,970	K 104
	Bronchial glands (through guinea-pig).	10	7th	66	12	sub.	342	2,030	2,300	K 105

Post-mortem Results.					
Local lesion.	Local glands.	Lungs.	Bronchial glands.	Spleen.	Kidneys.
Cystic	Nil	Several tubercles; marginal caseous patches.	Nil	Nil	Nil.
—	—	Slightly enlarged; tissue largely replaced by grey semi-confluent caseous nodules	Nil	Nil	Several grey tubercles.
Cystic	Nil	Scattered grey nodules with caseous foci.	Nil	Two calcareous tubercles.	Two grey foci.
Ulcer	Nil	Several small grey tubercles.	Nil	Nil	Six tubercles.
Cystic	Nil	Scattered grey nodules with opaque, caseous foci.	Caseous foci.	Nil	Nil.

The Distribution of Infection in Animals Experimentally fed with Tubercle Bacilli.

For the purpose of comparison with the condition found in the above series of children and with particular reference to the question whether tubercle bacilli can pass through the alimentary tract and set up lesions in distal organs without leaving evidence of infection at the portal of entry, the following results are recorded on experimental tuberculosis produced in animals by feeding.

Table VIII., p. 98, summarises with reference to this question the results of certain feeding experiments conducted for the Tuberculosis Commission. It will be seen that distal infection without lesions at the portal of entry was extremely rare except in the case of the dog.

For the purpose of obtaining further data as to the incidence of tubercle bacilli in the body after the ingestion of tuberculous food, we have been instructed by the Local Government Board to conduct a special series of experiments on this subject at Cambridge.

Eighteen young pigs, ascertained by application of the tuberculin test to be free from tuberculosis, were fed with small doses of cultures of tubercle bacilli contained in milk. The pigs were killed after the lapse of from 84 to 167 days and carefully examined, the post-mortem investigation being supplemented in many instances by guinea-pig tests of tissue apparently normal. The results of this enquiry are summarised in Table IX., p. 100. Attention may be called (*a*) to the uncertainty of producing infection by feeding with small doses, (*b*) to the occasional occurrence, as with children, of tubercle bacilli in apparently normal tissue, and, in particular, (*c*) to the absence of distal dissemination in all cases where no infection was found in the glands directly draining the alimentary tract.

This part of our research was also useful in connection with our investigation of localised tuberculosis in swine, a report on which is now in course of preparation and will contain further observations, relative to this latter subject, on the above experiments.

TABLE VIII.

Results of 462 Feeding Experiments with Mammalian Tubercle Bacilli upon Eight Species of Animals recorded in the Appendices to the Reports of the Tuberculosis Commission;

AND

TABLE IX.

Distribution of Lesions in 18 Pigs fed with Culture of Mammalian Tubercle Bacilli.

Table VIII.—Results of 462 feeding experiments with mammalian tubercle bacilli upon eight species of animals recorded in the Appendices to the Reports of the Tuberculosis Commission.

Species of Animal.	Number of experiments.		Number of cases where glands of the alimentary tract were found tuberculous, with or without lesions elsewhere.		Number of cases with completely negative results.		Cases where the alimentary tract and the glands draining it were found free from tuberculosis but tuberculous lesions were found elsewhere.
	Fed with bacilli of high virulence for bovines and rabbits.	Fed with bacilli of low virulence for bovines and rabbits.	Fed with bacilli of high virulence for bovines and rabbits.	Fed with bacilli of low virulence for bovines and rabbits.	Fed with bacilli of high virulence for bovines and rabbits.	Fed with bacilli of low virulence for bovines and rabbits.	
Bovines	25	12	24	11	1	1	None.
Cats	20	8	15	1	2	7	Three cats, fed with bacilli of bovine type, showed tuberculosis of the lungs; in one of these cases the disease appeared due to antecedent (spontaneous) infection.
Dogs	24	6	11	2	7	3	In six dogs fed with bacilli of bovine type, and in one fed with bacilli of human type, tubercles were found in the lungs.
Goats	12	3	11	3	1	—	None.
Guinea-pigs	130	13	61	13	67	—	Of two guinea-pigs fed with bovine tubercle bacilli, one showed a few tubercles in the lungs; in the other the bronchial glands were caseous; in both cases the disease was thought due to bacilli accidentally inhaled.

	Monkeys, baboons and chimpanzees.	60	17	44	15	11	2	In five animals, fed with bacilli of bovine type, there was advanced disease of the lungs. In one of these cases it was thought the disease may have been due to antecedent (spontaneous) infection ; in the others bacilli may have been inhaled in the course of feeding by pipette.
	Pigs	65	28	49	25	16	1	In one pig, fed with bacilli of low virulence, there was one chronic tubercle in the lungs, in which no bacilli could be found ; in a second pig, also fed with bacilli of low virulence, the liver showed a small grey tubercle and a hard encapsuled nodule, in neither of which could tubercle bacilli be found.
	Rabbits	35	4	20	1	13	1	Four rabbits, two fed with bovine bacilli and two with slightly virulent human bacilli, showed tubercles in the lungs. It was thought that the bacilli might have been accidentally inhaled during feeding by pipette.
Summary.	Eight species ...	371 / 91 (462)		235 / 71 (306)		118 / 15 (133)		23 cases, 18 fed with bacilli of high virulence and five fed with bacilli of low virulence. With the exception of the seven cases in dogs, these cases seem largely explained by accidental inhalation during experimental feeding or antecedently.

The above data have been collected from investigations, made by Drs. A. S. and F. Griffith and Dr. Cobbett, which are published in the following reports issued by the Tuberculosis Commission :—Appendix to Second Interim Report, Vols. I and II (1907), Appendix to Third Interim Report (1909), and Appendix to Final Report, Vols. I, II and III (1911).

Table IX.—Distribution of lesions in 18 *pigs fed with culture of mammalian tubercle bacilli.*

All the pigs except 13 and 14 were fed with virulent bovine cultures 10–14 days old on serum.

Number of pig and dose.	Duration of experiment.	Sub-maxillary lymphatic glands.	Mesenteric glands.	Lungs.	Bronchial glands.	Liver.	Portal glands.	Spleen.
	Days.							
1. ·01 mg.; 88 days later, ·01 mg.	166	Nil visible; inoculation experiments negative.	Nil visible; inoculation experiments negative.	Nil	Nil ...	Nil	Nil ...	Nil.
2. ·01 mg. ...	87	No visible lesions, but the left glands produced tuberculosis in guinea-pigs.	Nil	Nil	Nil ...	Nil	Nil ...	Nil.
3. ·001 mg. ...	88	Nil	Nil	Nil	Nil ...	Nil	Nil ...	Nil.
4. ·001 mg. ...	87	On both sides moderately enlarged and beset with discrete caseous nodules.	Nil	Two minute grey tubercles with opaque centres.	Nil ...	Three grey foci, of doubtful appearance, which failed to infect guinea-pigs.	Nil ...	Nil.
5. ·0001 mg.; 88 days later, ·1 mg.	166	One gland contained three small caseo-calcareous tubercles.	A small caseo-calcareous nodule in one.	Nil	Nil ...	Nil	Nil ...	Nil.
6. ·0001 mg.; 88 days later, ·1 mg.	167	Nil visible; inoculation experiments negative.	One completely caseous.	Two minute tubercles.	Nil ...	Two minute tubercles and tubercle bacilli found in apparently normal tissue.	One caseous focus.	Nil.

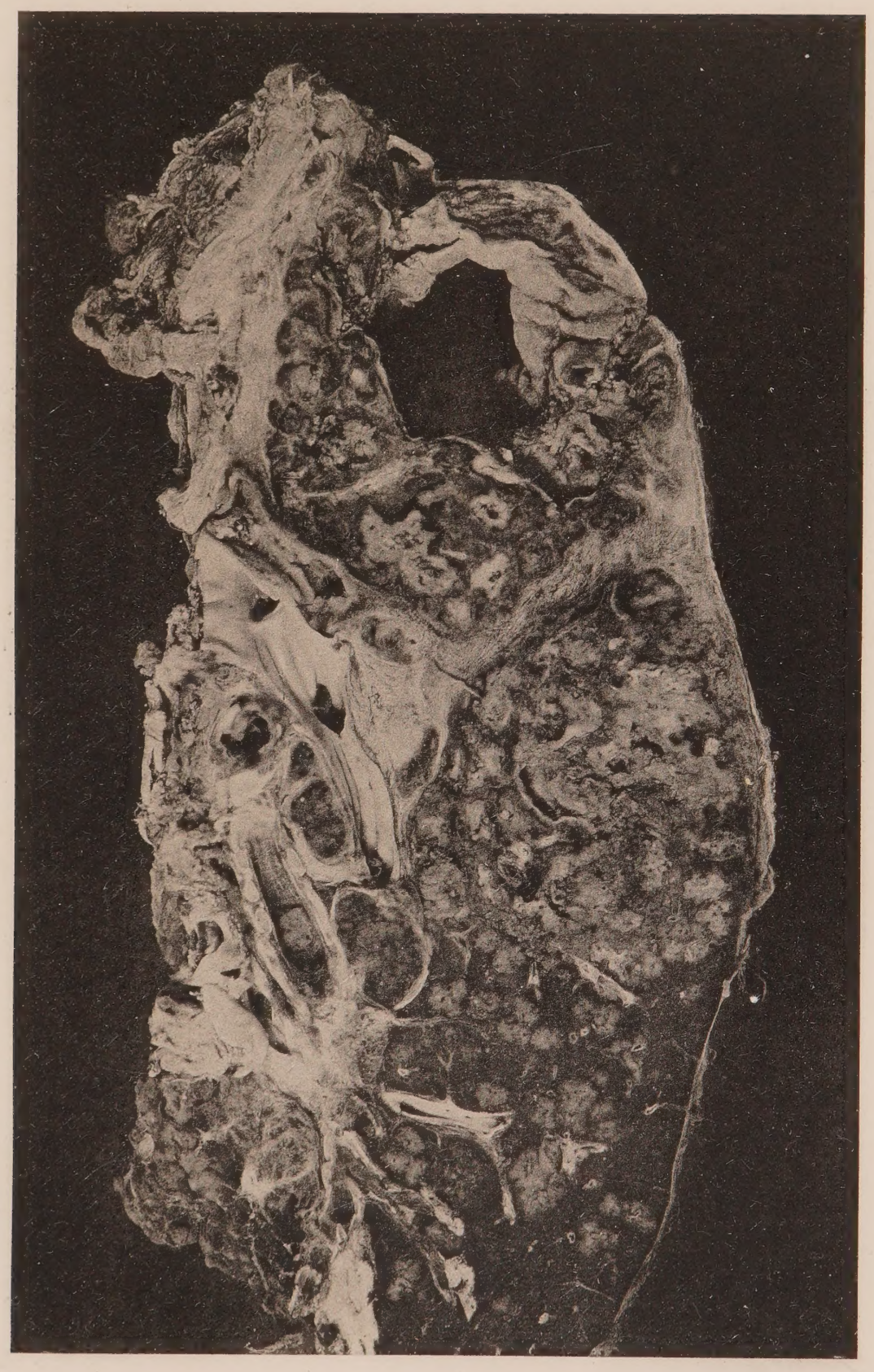
7. ·001 mg. ...	84	Nil visible ; inoculation experiments negative.	Nil	Nil	Nil ...	Nil	Nil ...	Nil.
8. ·001 mg. ...	84	Nil visible ; inoculation experiments negative.	Nil	Nil	Nil ...	Nil	Nil ...	Nil.
9. ·01 mg. ...	84	On each side one was caseo-necrotic ; a third contained a few tubercles.	Numerous large caseous-necrotic nodules.	Scanty minute caseating tubercles.	One caseous focus.	Scanty minute caseating tubercles.	Several minute caseous foci.	Nil.
10. ·01 mg. ...	84	Nil visible ; inoculation experiments negative.	Two small ileocolic glands were partly caseous and there were caseous foci in a third.	Nil	Nil ...	Two minute tubercles.	Some caseous foci.	Nil.
11. ·1 mg. ...	85	Nil	Enlarged and extensively tuberculous.	Scattered minute caseating tubercles.	Several contained small caseous patches.	Scattered minute caseating tubercles.	Caseous patches in three.	Nil.
12. ·1 mg. ...	85	On each side one was enlarged and caseo-calcareous.	Many were enlarged and caseous.	Small scattered caseating tubercles.	Discrete caseous tubercles and patches.	Small scattered caseating tubercles.	Discrete caseous tubercles and patches.	Two small tubercles.
*13. 10 mg. (human).	86	On each side two were enlarged and contained caseous nodules.	The majority contained discrete caseous tubercles.	Three small translucent tubercles with caseous centres and tubercle bacilli found in apparently normal tissue.	Nil ...	One minute opaque tubercle and two small grey nodules which failed to infect guinea-pigs.	Nil ...	Nil.

* This pig was fed with culture of "human" (eugonic) bacilli 14 days old on serum.

Number of pig and dose.	Duration of experiment.	Submaxillary lymphatic glands.	Mesenteric glands.	Lungs.	Bronchial glands.	Liver.	Portal glands.	Spleen.
	Days.							
*14. 50 mg. (human).	86	On each side two were enlarged and contained caseous, gritty areas.	All slightly enlarged and contained discrete caseous and gritty areas.	Nil visible, but tubercle bacilli found in apparently normal tissue.	Nil ...	Five submiliary tubercles and tubercle bacilli found in apparently normal tissue.	No definite tubercles.	Nil.
15. ·005 mg. ...	85	Nil visible ; inoculation experiments negative.	Nil definite ...	Nil	Nil ...	Nil	Nil ...	Nil.
16. ·005 mg. ...	85	Nil visible ; inoculation experiments negative.	Nil	Nil	Nil ...	Nil	Nil ...	Nil.
17. ·002 mg. ...	84	Nil	One caseo-calcareous almost throughout.	Nil visible, but tubercle bacilli found in apparently normal tissue.	Nil ...	A few miliary tubercles and tubercle bacilli found in apparently normal tissue.	Several tuberculous foci.	Nil.
18. ·002 mg. ...	84	Nil visible ; inoculation experiments negative.	Nil	Nil	Nil ...	A few doubtful nodules.	Nil ...	Nil.

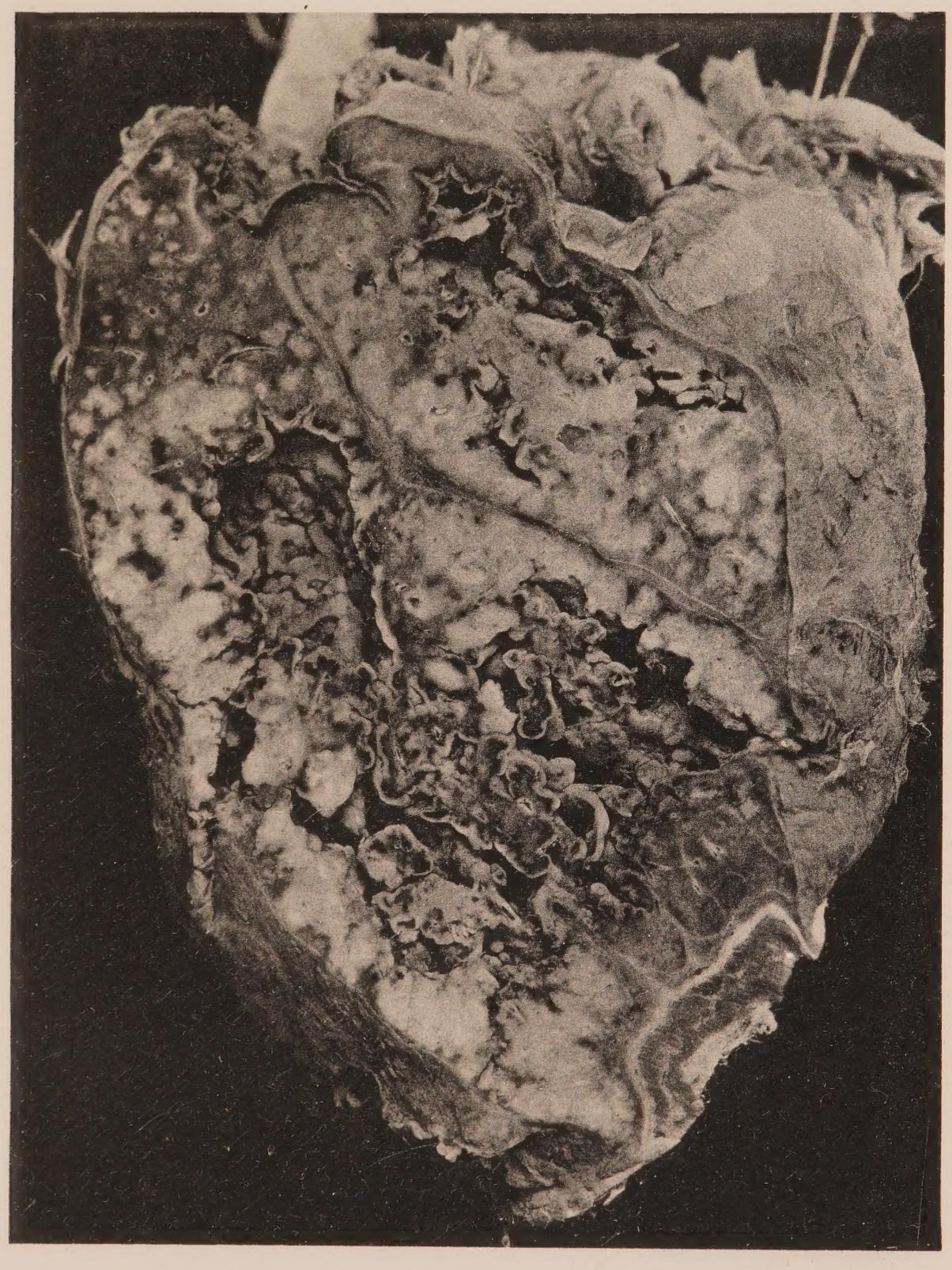
* This pig was fed with culture of "human" (eugonic) bacilli 14 days old on serum.

Plate I



H2, male child, 5 years old. Longitudinal section through left lung, showing cavity at apex — (slightly enlarged)

Plate II



H 106; *male child, 3 years old. Longitudinal section through left lung, showing severe chronic tuberculosis. (slightly enlarged)*

Plate III

H47, male child, 2 3/4 years old. Lower end of ileum, showing tuberculous ulceration produced by tubercle bacilli of bovine type (actual size)

Plate IV

H 47, *male child, 2 3/4 years old Commencement of large intestine, showing extensive ulceration caused by tubercle bacilli of bovine type (slightly reduced)*

Plate V

PLATE V.

CULTURES ON GLYCERIN-AGAR OF RELATIVELY DYSGONIC TUBERCLE BACILLI, ALL OF HIGH VIRULENCE FOR THE RABBIT.

These reproductions, except No. 1, illustrate the maximum growth obtainable in four months, and are the actual size of the originals.

1. Culture (through guinea-pig) from mesenteric glands of H 140, 7th generation ; minute grey colonies just visible at the end of five weeks.

2. Direct culture from bronchial gland of H 37, 5th generation.

3. Culture (through guinea-pig) from mesenteric glands of H 14, 6th generation.

4. Direct culture from mesenteric gland of H 27, 3rd generation.

5. Direct culture from mesenteric gland of H 105, 7th generation.

6. Culture (through guinea-pig) from liver of H 96, 6th generation.

7. Culture (through guinea-pig) from mesenteric glands of H 50 ; discrete colonies still visible in upper part of tube.

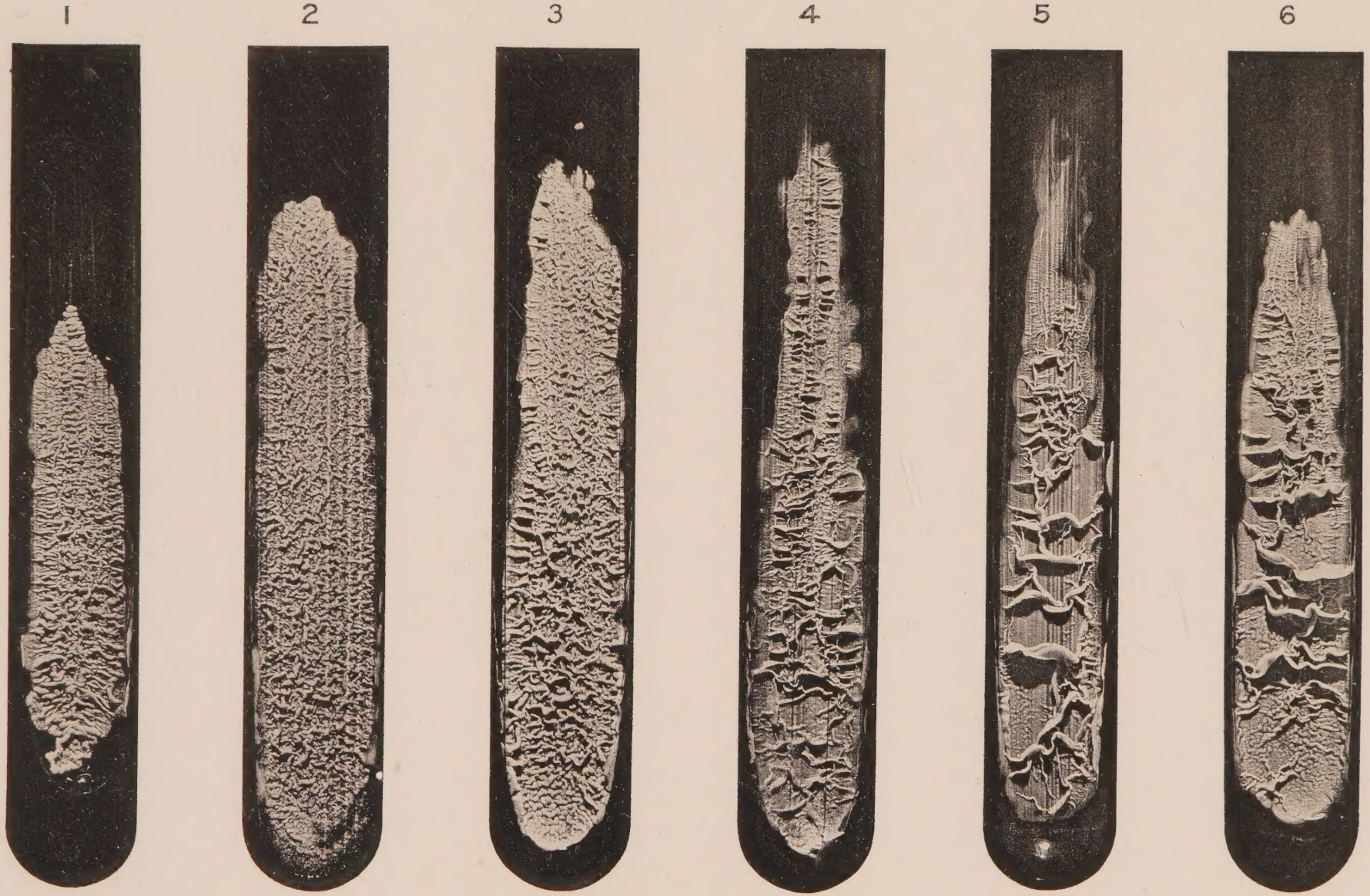
PLATE VI.

CULTURES ON GLYCERIN-AGAR OF EUGONIC TUBERCLE BACILLI, ALL OF RELATIVELY LOW VIRULENCE FOR THE RABBIT.

These reproductions illustrate the maximum growth obtainable, and are the actual size of the originals.

1. Direct culture from bronchial gland of H 103, 6th generation.
2. Direct culture from mesenteric gland of H 46, 3rd generation.
3. Culture (through guinea-pig) from mesenteric glands of H 108, 5th generation.
4. Culture (through guinea-pig) from mesenteric glands of H 39, 3rd generation.
5. Direct culture from bronchial gland of H 143, 8th generation.
6. Culture (through guinea-pig) from mesenteric glands of H 110, 5th generation.

Plate VI



An Enquiry, based on a series of Autopsies, into the Occurrence and Distribution of Tuberculous Infection in Children, and its Relation to the Bovine and the Human Types of Tubercle Bacilli respectively; by A. Stanley Griffith, M.D.

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Introduction.

This enquiry has been undertaken for the Local Government Board with the object of gaining further information as to (*a*) the frequency of tuberculous infection, latent or manifest, in childhood; (*b*) the distribution of the disease within the body; and (*c*) the relative incidence of the bovine and the human types of the tubercle bacillus.

No further work was needed to show that tuberculosis in childhood is sometimes due to infection with tubercle bacilli of bovine origin, as this fact has been established conclusively by the recent work of the Royal Commission on Tuberculosis. The investigators of this Commission made a careful bacteriological study of the tubercle bacilli obtained from the tuberculous lesions of 38 children, from 7 months to 8½ years of age, who had died of tuberculosis or other cause, and from tuberculous glands (8 cervical, 1 axillary) removed by operation from 9 children, 1 to 12 years of age; they found that the bovine tubercle bacillus was responsible for the lesions in 17 cases, the human tubercle bacillus in 28 cases, and that in two cases there was a mixture of the two types of bacilli.

But these data do not afford an accurate basis for inference as to the relative frequency of infection with the bovine and the human types of bacilli, as the cases investigated were specially selected,

preference being given to those in which the portal of entry appeared to be the alimentary canal. It might therefore appear that in the above series the proportion of cases infected with the bovine tubercle bacillus is probably higher than it would have been if the investigators had devoted equal attention to all forms of tuberculosis as they occur in childhood.

And in support of this objection the work of Gaffky* and Rothe† and Ungermann‡ may be quoted. Gaffky and Rothe investigated the bodies of 400 children taken in unselected series as they came to the post-mortem room, irrespective of the cause of death, and found tuberculous infection in 78. In 75 of these cases the infection was due to the human tubercle bacillus, in one to the bovine tubercle bacillus, and in the remaining two they were unable to obtain cultures and therefore the type of bacillus was not determined. Ungermann investigated a similar unselected series of 171 children (age 0—12 years), and found 39 cases tuberculous, 37 due to the human, and two to the bovine tubercle bacillus.

In the present research particular care has been taken to avoid any element of selection. All the cases which came to autopsy during the period of enquiry at the institutions assisting in the investigation were submitted to bacteriological examination without regard to the extent or presumed mode of origin of such tuberculous lesions as might be present.

The results obtained therefore give in accurate proportion the relative incidence of human and bovine tubercle bacilli in an unselected series of tuberculous children. Except in two institutions, from which cases recognisable at autopsy as tuberculous alone were investigated, the enquiry was directed to every case, irrespective of the cause of death, which came to the post-mortem room, whether visibly tuberculous or apparently free from this disease ; and in all the latter cases the presence or absence of tubercle bacilli in apparently non-tuberculous tissues was determined by inoculation of guinea-pigs. The total number of cases examined was 73, all being children under 12 years of age.

To various pathologists I wish to express my thanks for their careful and very complete post-mortem notes of the cases examined and for enabling me to undertake the bacteriological part of the enquiry. I am also highly indebted to Professor G. Sims Woodhead who kindly allowed me to utilise the Field Laboratories of the University of Cambridge for the purpose of carrying out the experimental and cultural tests requisite for the bacteriological work.

Method of Bacteriological Investigation.

Both in the visibly tuberculous and also in the apparently not tuberculous cases the mesenteric and bronchial glands were investigated,§ and sometimes also the cervical glands or other tissues.

When the glands presented from the exterior no evidence of tuberculosis they were removed in the following way :—

The mesentery was pinned out on a board and its surface was seared lightly but efficiently with a cautery. The mesenteric glands

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* Zur Frage der Infektionswege der Tuberkulose. Tuberculosis Bd. 6, 1907.

† Untersuchungen über tuberkulöse Infektion in Kindesalter. Veröffentlichungen der R. Koch-Stiftung. Heft. 2.

‡ Untersuchungen über die tuberkulöse Infektion der Lymphdrüsen in Kindesalter. Tuberkulose-Arbeiten a. d. Kais. Gesundheitsamte. Heft 12. 1912.

§ In a few instances only one of these groups of glands was submitted to examination.

were then excised with instruments sterilized by boiling. The largest mesenteric glands were taken and were selected from different parts of the mesentery, an ileo-colic gland or two being often included. The number of glands removed in each case is given in the tabular summary of these experiments.

In the case of the bronchial glands greater pains were necessary to ensure that any chance external contamination had been destroyed. It occasionally happened that some of the bronchial glands, usually the intertracheo-bronchial, were uncovered by pleura, or one or two might have been cut in the previous examination of the body. Such glands were used only when they were enlarged and it was possible to sterilize completely their cut surfaces. As in the case of the mesentery, the trachea and bronchi were pinned out and the pleura covering the glands was seared ; if portions of any of the glands were exposed these surfaces were also seared.

Whenever cervical glands were used they were dealt with in the same way.

The excised glandular material was placed in a sterile mortar, pounded up, emulsified with salt solution and filtered through muslin. From two to four guinea-pigs were inoculated intraperitoneally with each emulsion. Usually only two-thirds to three-quarters of the emulsion were inoculated, the rest being kept in reserve, should the guinea-pigs die prematurely. Whenever this happened or seemed likely to happen the reserved emulsion was treated with 2 per cent. of antiformin for half-an-hour and then inoculated either immediately or after centrifuging.

When the glands (or other tissues) were tuberculous they were more easily dealt with, as only small portions of such tissue are necessary to render a guinea-pig tuberculous.

The surface of the tuberculous part, whether gland or organ, was seared and the material for investigation was cut from the centre of the seared area. Emulsions of tuberculous tissues were prepared in precisely the same way as emulsions of normal tissues.

In all instances where there was suitable material an attempt was made to get a culture direct.

Guinea-pigs showing no outward sign of infection were allowed to live after inoculation a minimum period of six weeks, but when they showed evidence of tuberculosis they were killed earlier so as to secure a culture as soon as possible.

The medium used throughout for raising cultures has been the egg medium and in no instance have I failed to secure a culture from the tissues of a tuberculous guinea-pig.

There have been many failures to grow the bacilli direct from human tissues, either owing to contaminating and rapidly growing organisms or to paucity of tubercle bacilli in the material. In a few cases the difficulty of obtaining a culture direct, due to the presence of other organisms, has been overcome by the use of antiformin ; and I think that a larger number of direct cultures might have been obtained if this method had been applied more frequently.

The antiformin method was as follows : The emulsion was diluted with salt solution to 9·5 cc. and 0·5 cc. antiformin added ; in from 15 to 20 minutes the mixture was centrifuged and the deposit sown on to the egg medium.

Subcultures were made upon serum, and serum cultures only have been used for the virulence tests (except in one instance when a primary egg culture was used).

Tests Employed to Determine Type of Tubercle Bacillus.

Bovine and human tubercle bacilli are distinguished from each other by their growth characters and their virulence for certain species of animals.

There are other distinctions, morphological and biochemical, which can, in the majority of cases, be brought out between the two types, but these are not sufficiently constant to be relied upon.

The cultural and pathogenic differences between standard bovine and standard human tubercle bacilli are, however, so constant and well marked that it is unnecessary to employ other tests, and in this investigation the classification of the tubercle bacilli is based solely upon growth characteristics and pathogenicity.

The media used for determining the cultural characters of a given strain have been mainly glycerin potato and glycerin agar, and less frequently glycerin serum and glycerin broth. On these media human tubercle bacilli grow luxuriantly, producing, under favourable conditions, raised creamy wrinkled continuous layers, which often spread up the sides of the tube or flask.

Bovine tubercle bacilli, on the other hand, grow with less luxuriance than human tubercle bacilli; they vary in their growth capacity, some being very dysgonic, others relatively eugonic, but the best growing bovine tubercle bacillus is readily distinguished from the human tubercle bacillus if its manner of growth is studied from week to week on all the glycerin media. Glycerin potato, in my experience, brings out most clearly the difference between relatively eugonic bovine tubercle bacilli and human tubercle bacilli.

The animals which may be employed to differentiate between standard bovine and standard human tubercle bacilli are the calf, goat, pig, cat and rabbit.

For routine use the rabbit is the most convenient laboratory animal and can be relied upon to differentiate with certainty between bovine and human tubercle bacilli of standard virulence.

In employing the test certain precautions with regard to dose and vigour of cultures must, however, be observed.

If the intravenous method be used, the dose should not be large, since large doses of human tubercle bacilli sometimes produce an acute tuberculosis in rabbits, not easily distinguishable from that set up by bovine tubercle bacilli. 0·01 mgrm. is a suitable intravenous dose. In my experience this dose of human tubercle bacilli has not caused death from tuberculosis within 90 days, whereas bovine tubercle bacilli in equal dose have invariably given rise to general tuberculosis, fatal within six weeks.

If the subcutaneous method be chosen the dose should not be less than 10 mgrms., since smaller doses of bovine tubercle bacilli thus administered may produce a slowly progressive chronic tuberculosis, and such results fail to bring out the valuable distinction of rapidly fatal tuberculosis after bovine tubercle bacilli and the slowly progressive tuberculosis, not fatal within the period of observation, which sometimes follows inoculation with human tubercle bacilli.

It is of high importance as well in estimating virulence as in determining cultural characters to use only young and vigorous subcultures. In this enquiry the standard dose for subcutaneous inoculation has been 10 mgrms., for intravenous 0·01 mgrm. of young

serum cultures. In the case of the human strains larger doses have frequently been given.

In the tabular summaries of these experiments the doses, the age and generation of the cultures, and the results obtained are presented.

Cultural Characters and Virulence of the Strains Isolated.

Cultural characters.—Altogether 91 strains from various sites in the bodies of 35 children have been tested; of these strains 21 were obtained direct and 70 through the guinea-pig. 72 strains from 28 cases exhibited the cultural characters of the human tubercle bacillus and 16 strains from 6 cases have grown like bovine tubercle bacilli. In every one of the cases from which two or more strains were isolated the different strains displayed identical cultural characters.

Of the remaining three strains, derived from the bronchial glands of a child aged five years (Case 31), one displayed the cultural characters of a human tubercle bacillus, the other two those of a bovine tubercle bacillus. The eugonic strain was obtained from the spleen and one of the dysgonic strains from the sternal gland of one of two guinea-pigs inoculated with the bronchial gland emulsion. The other dysgonic strain was obtained from the omentum of the other guinea-pig (see page 115).

Pathogenicity.—The pathogenic properties of cultures from each of the 35 children whose tissues yielded cultures have been studied in the rabbit only.

Except in one instance in which one rabbit alone was used, two or more rabbits have been inoculated with cultures from each case.

Fourteen strains of culture from six cases, all of which exhibited the cultural characters of bovine tubercle bacilli, produced in all but two of the 27 rabbits inoculated the severe progressive tuberculosis which is characteristic of tubercle bacilli of bovine tuberculosis, the subcutaneously inoculated rabbits dying in from 31 to 78 days, those inoculated intravenously in from 28 to 30 days.

One of the exceptional rabbits died 73 days after inoculation, but the tuberculosis found at autopsy, though generalised, was of no great severity; it was distinguished, however, from the moderately severe results occasionally produced by human tubercle bacilli by the lesions being more widespread and by the great enlargement and firm caseation of the nearest glands. This strain was later on retested and produced in two rabbits typical rapidly fatal general tuberculosis. It was noted when the strain was first tested that the growths were very thin, and I attribute the atypical result obtained with it to lack of vigour of culture. The experiment supplies an example of what may occur when cultures are used which are not well grown. The other exceptional rabbit had received 8·5 mg., which is less than the standard dose, and died in 99 days. The disease was very mild, and the only feature which distinguished it from that sometimes produced by human tubercle bacilli was the presence of projecting nodules in the kidneys.

The three strains of Case 31, of which two were dysgonic and one was eugonic, also proved of high virulence, producing rapidly fatal general progressive tuberculosis in all the rabbits inoculated. The eugonic culture was a mixture of human and bovine tubercle bacilli, in which the "bovine" element preponderated.

In all the rabbits inoculated subcutaneously with the above viruses the nearest glands were much enlarged and caseous throughout, and lymphatic glands all over the body generally showed tuberculous

lesions; the lungs were always severely affected; the kidneys contained tubercles in the more acute cases, nodules usually prominent and nail shaped in the more long-lived animals; the spleen and liver were affected in all but two cases, one being one of the exceptional rabbits mentioned above; the walls of the sacculus rotundus and vermiform appendix and the thyroid usually showed caseous lesions.

Fifty-one strains which grew luxuriantly on the differential media, and were derived from 28 children, produced in not one instance death from tuberculosis within the period of observation (90 days).

The usual event was that the rabbit was killed in good health, having increased in weight. The tuberculous disease was generally limited to the site of inoculation and the lungs; in some of the cases the nearest glands and the kidneys were also implicated.

The disease in the lungs varied in severity; usually it was slight, amounting only to a few scattered tubercles and a small marginal or superficial caseating patch or two; occasionally it was of moderate severity, and in one instance it was severe.

The local lesion was ulcerated only once; in all other cases it was caseous and softened and surrounded by a thin fibrous wall. Out of the 62 rabbits inoculated subcutaneously the nearest glands of 21 were tuberculous; generally the glands were only slightly affected, but occasionally they were much enlarged, caseous and softened throughout.

The kidneys of 40 rabbits were free from tuberculosis, while those of 22 showed lesions; in six of the latter only one focus was found, in 10 there were scattered tubercles, in one tubercles were moderately numerous, while in five there were small pits on the surfaces, the sites of healed tubercles; in no case was there a projecting nodule like those produced by bovine tubercle bacilli.

In one rabbit a portal gland contained a caseous focus, and in the spleen of another there was a single caseous focus.

These experiments show, as was also shown by the more extensive experiments of the Royal Commission on Tuberculosis, that the human tubercle bacillus inoculated subcutaneously rarely produces lesions in other regions than the nearest glands (where they are usually insignificant), lungs and kidneys. In the kidneys the disease, when present, is generally very slight.

So that if a rabbit killed after 90 days present tuberculosis more widespread than this, *i.e.*, if it affects the kidneys and the nearest glands severely or moderately severely and the spleen, the liver and lymphatic glands other than the nearest, the probability is that the culture inoculated contains bovine tubercle bacilli. If only one rabbit has been inoculated and this result is obtained, the test should be repeated.

Severe tuberculosis of the lungs of a rabbit inoculated with bacilli presumed to be human tubercle bacilli will always excite suspicion of presence of bovine tubercle bacilli even when the nearest glands of the rabbit are unaffected and there are no lesions, or only insignificant ones, in the other organs. This was so in the case of rabbit 336 (Case 8) and to remove the doubt a culture was recovered from the lungs and re-tested. The recovered culture was eugonic and produced only slight tuberculosis in a rabbit.

This and several examples in the work of the Royal Commission on Tuberculosis show that severe tuberculosis of the lungs may be produced in rabbits by human tubercle bacilli, a result which may

be due either to high susceptibility of the individual rabbit, greater initial dispersal of tubercle bacilli than usual, or greater vigour of the bacilli inoculated.

Inoculation of Tissue Emulsions.

In eight cases emulsions of the human tuberculous tissues were inoculated into the rabbit. The results obtained were in agreement with those of the culture inoculations. Material from five of the cases which yielded cultures of bovine tubercle bacilli produced general progressive tuberculosis in rabbits identical with that caused by bacilli of bovine tuberculosis. Material from three cases from which human tubercle bacilli were isolated produced only slight tuberculosis, the periods of observation varying from 70 to 97 days.

Summary of Bacteriological Investigation of an Unselected Series of Tuberculous Cases.

Cultures from 35 children have been isolated and tested as to their cultural characters and virulence.

Six cases yielded pure cultures of bovine tubercle bacilli ; 28 cases cases yielded pure cultures of human tubercle bacilli ; while from the remaining one a mixed culture of bovine and human tubercle bacilli was obtained.

The table which follows shows at each age period the number of cases yielding cultures investigated and the number of human, bovine and mixed infections.

Age Periods.	Number of Cases.	Infections.		
		Number of Bovine.	Number of Human.	Number of Mixed.
0 to 1 year	3	—	3	—
1 to 2 years	4	2	2	—
2 to 3 years	6	1	5	—
3 to 4 years	7	3	4	—
4 to 5 years	4	—	4	—
5 to 6 years	5	—	4	1
6 to 7 years	2	—	2	—
7 to 8 years	—	—	—	—
8 to 9 years	1	—	1	—
9 to 10 years	1	—	1	—
10 to 11 years	1	—	1	—
11 to 12 years	1	—	1	—
Total	35	6	28	1

The Cases from which Bovine Tubercle Bacilli were Isolated.

Bovine tubercle bacilli have been isolated from six of the children. Four of these died of tuberculosis, the immediate cause of death in three being tuberculous meningitis and in one abdominal tuberculosis or tabes mesenterica. The other two children died of other causes, one of scalds, the other of measles and broncho-pneumonia ; the tuberculous lesions were found at the autopsy and were in one case limited to the intestine and mesenteric glands and in the other to the mesenteric and bronchial glands.

The details of the cases are summarised in the table which follows :—

No. of Case.	Age and sex of patient.	Distribution of tuberculosis.	Cause of Death.	Primary seat of disease.	Bovine tubercle bacilli isolated from the
62	$1\frac{7}{12}$ year, male.	Generalized ...	T. Meningitis	Intestines...	Mesenteric and bronchial glands.
67	$1\frac{9}{12}$ year, male.	Generalized ...	T. Meningitis	Pharynx and intestines.	Pharyngeal and mesenteric glands.
70	2 years, male.	Localized ...	Measles and br. pneumonia.	Mesenteric glands.	Mesenteric and bronchial glands.
41	3 years, female.	Intestines, mesenteric and bronchial glands and lungs.	Tabes mesenterica.	Intestines...	Mesenteric and bronchial glands.
51	3 years, female.	Generalized ...	T. cerebro-spinal meningitis.	Intestines...	Mesenteric glands, lungs and spleen.
60	3 years, male.	Localized ...	Scalds... ...	Intestines...	Mesenteric and bronchial glands.

The four children who died of tuberculosis showed intestinal ulceration and great enlargement and caseation of the mesenteric glands, the tuberculosis being older and more extensive in these than in any other group of glands.

One of the cases (No. 67) showed extensive ulceration of the tonsils and pharynx as well as of the intestines and was remarkable for the very large numbers of tubercle bacilli which were present in scrapings from the ulcers.

The pathological anatomical picture in these four cases was primary tuberculosis of the mucous membrane of the alimentary tract, secondary tuberculosis of the adjacent glands, with disseminated miliary tuberculosis in three cases and early tuberculosis of lungs and bronchial glands in the fourth. The child who died of burns showed slight tuberculosis of the intestines and caseation of the mesenteric glands. The bronchial glands, though they presented no macroscopic evidence of tuberculosis, produced tuberculosis in guinea-pigs and a culture derived from one of them was identical with the mesenteric gland strain. The sixth child died of broncho-pneumonia and showed caseous mesenteric and intertracheobronchial glands, no tuberculous lesions being found anywhere else in the body ; tubercle bacilli were more numerous in the bronchial glands than in the mesenteric glands.

The Cases from which Human Tubercle Bacilli were Isolated.

Human tubercle bacilli have been isolated from 26 tuberculous and two not apparently tuberculous children. The tuberculous cases only are considered in this section.

In 19 of the 26 tuberculous cases cultures were derived from two or more sites, while in the other seven only one strain was cultivated. In each of the cases from which two or more strains were isolated the different strains were identical in cultural character and virulence, and there was no evidence of mixture.

Fourteen of the children died of tuberculous meningitis, six of pulmonary tuberculosis, one of tuberculous peritonitis, one of miliary tuberculosis of the lungs and lymphadenoma, and four of causes other than tuberculosis.

There was greater variation in the localisation of the oldest and most severe lesions in these cases than in those infected with bovine tubercle bacilli. In some of the children the tuberculosis was most advanced in the thorax, the bronchial glands or the lungs showing the more extensive disease ; in others the disease was most severe in the glands of the alimentary tract. In a few cases the primary seat of disease was uncertain.

The cases will now be considered in accordance with this classification which is based on anatomical distribution of tuberculous lesions.

Class I.—Bronchial Gland Tuberculosis.

In 16 of the 26 children the bronchial glands were more severely affected than any other regionary glands in the body. The glands on one side were usually larger and more advanced in caseation than those on the other, and in six of the cases a caseous nodule was found in the pulmonary tissue drained by the more severely affected bronchial glands. Thirteen of these children died of tuberculous meningitis, and there was miliary tuberculosis of greater or less severity of lungs, liver, spleen, and kidneys.

In one case (No. 39) the disease was localised in the intertracheobronchial glands and was retrogressive.

In connection with the question of the portal of entry of the bacilli in these cases, the condition of the mesenteric glands is of importance. In nine cases the mesenteric gland lesions were miliary tubercles and were most probably caused by bacilli disseminated from the thoracic lesions. In two cases the mesenteric glands were not available for bacteriological examination, and no notes had been made at the autopsy as to their condition.

In one case they were normal. In four cases (Nos. 34, 43, 53, and 55), of which two showed intestinal ulceration, they contained caseous nodules or were partly or wholly caseous. These lesions could not have been produced by tubercle bacilli disseminated from the thoracic lesions, for there were no disseminated lesions of equal size anywhere else in the body, nor could they have been produced by bacilli coughed up from the lungs and ingested, for there were no ulcerated lesions in the lungs. They were in my opinion most likely produced by bacilli which had been ingested at or about the same time as infection in the thorax occurred. On this view these cases would be cases of simultaneous infection in the thorax and abdomen.

Class II.—Primary Pulmonary Tuberculosis.

In six cases (Nos. 2, 7, 47, 54, 58 and 73) there was tuberculosis of the lung with cavity formation, the tuberculosis being apparently primary in the lung. The bronchial glands were tuberculous in each case and in four were very large and extensively caseous, in one partly caseo-calcareous and in the sixth only slightly caseous. In every instance there was tuberculosis of the intestine and mesenteric glands amply accounted for by the condition of the lungs. One of the children aged 2 years died of suppurative meningitis, and the tuberculosis was found at the post-mortem examination ; it was

limited to the lungs and bronchial and mesenteric glands. The other five died of tuberculosis ; one of miliary tuberculosis, two of general tuberculosis, and two of pulmonary tuberculosis ; their ages were $1\frac{3}{12}$, 2, $4\frac{8}{12}$, 9, 10 and 11.

Of interest is the definite evidence of an old primary lesion in the lungs of two of the children (Nos. 47 and 73), the bronchial glands on the corresponding side being more severely effected than those on the other.

It is widely held that ulcerative pulmonary tuberculosis in the adolescent and adult is the final stage of an infection acquired in childhood. To what extent this is the case might, it seems to me, be determined by carefully examining the hilus glands in all cases of adult phthisis which come to autopsy. As the bronchial glands in the primary thoracic tuberculosis of children are invariably implicated, absence of evidence of long standing tuberculosis in these glands in the adult would be ground for inferring that the disease was probably not contracted in early childhood.

Class III.—Alimentary Tuberculosis.

There was one case (No. 45) which was undoubtedly due to bacill which had entered the body by way of the intestinal tract. The mesenteric glands were enlarged and caseous, and the child died of tuberculous meningitis and general miliary tuberculosis. The bronchial glands were very slightly affected, containing only two caseous tubercles. This case, which yielded the human bacillus, presented no feature by which it could be distinguished from cases (*e.g.*, Nos. 51 and 62) due to the bovine tubercle bacillus.

Another child, who died of broncho-pneumonia, showed submiliary tubercles, containing tubercle bacilli, in the mesenteric glands and no sign of tuberculosis elsewhere ; the bronchial glands contained tubercle bacilli, however, as was shown by the guinea-pig inoculation experiments. On account of the mesenteric glands being the only tissue to show macroscopic tuberculous lesions this case has been classed as one of ingestion tuberculosis.

Class IV.—Primary Seat of Disease Uncertain.

There are two cases in this class. Case 5 showed both in the bronchial glands and in the mesenteric glands calcareous nodules which no longer contained living tubercle bacilli. The child died of shock following operation for tubercular spinal caries. The culture was isolated from a cervical gland.

The other case (No. 19), a child of 11 months, showed caseo-purulent foci in the spleen and a doubtful focus in a bronchial gland, neither of which produced tuberculosis in the guinea-pig. Bronchial glands which were normal to the naked eye produced tuberculosis in a guinea-pig and a human culture was isolated. As the guinea-pigs inoculated with mesenteric glands remained healthy, the portal of entry of the bacilli was probably the respiratory tract.

Family History.—There was definite history of consumption in the near relatives of only four of the 28 children from whom human tubercle bacilli were isolated. In 14 cases it was stated in the notes that there was no family history of tuberculosis. In the remaining 10 cases no history had been obtained.

Case from which a Mixed Culture was Isolated.

This is an interesting but unfortunately an incomplete case.

A child of 5 years of age (Case 31) who died of tuberculous meningitis, showed at the autopsy calcareous nodules in the mesenteric and the bronchial glands, caseo-calcareous and softened tuberculosis of one lobe of the lung with miliary tubercles elsewhere, tuberculosis of left kidney and bladder, slight submiliary tuberclosis of liver and right kidney and tuberculous meningitis. There was evidence, therefore, of infection by both the alimentary and respiratory routes. The mesenteric and bronchial glands and a portion of meninges only were used. An emulsion of the mesenteric glands did not produce tuberculosis in guinea-pigs. A guinea-pig inoculated with meninges died of a subacute infection, and another guinea-pig inoculated subsequently with what remained of the emulsion after treatment with antiformin did not develop tuberculosis. Of the two guinea-pigs inoculated with bronchial gland nodules one died in 10 days, but a culture of tubercle bacilli was obtained from its omentum. The other developed tuberculosis, and cultures were obtained from a sternal gland and the spleen. The single strain from the first guinea-pig and the sternal gland strain of the second were typically bovine in cultural characters and virulence; the spleen strain of the second guinea-pig was a mixture of human and bovine tubercle bacilli, the bovine tubercle bacilli being present in preponderating numbers, as as was shown by its behaving in the rabbit precisely like a pure culture of bovine tubercle bacilli.

As both human and bovine tubercle bacilli were demonstrated to be present in the bronchial glands of this child, it is impossible to say, in the absence of cultures from any other region of the body than the bronchial glands, which of the two types was the cause of the death of the child.

Cases which though apparently Tuberculous did not produce Tuberculosis in Guinea-pigs.

In five children dying from other causes (Cases 9, 20, 38, 48 and 69) isolated caseous or calcareous tuberculous lesions were found which did not produce tuberculosis in guinea-pigs. In four of the five cases the tuberculous disease was localised in the mesenteric glands, and in the fifth in the bronchial glands, and only one set of glands in each case was implicated.

Not only the obviously tuberculous glands in these cases but also mesenteric or bronchial glands normal to the naked eye failed to produce tuberculosis in guinea-pigs.

Microscopical examination was positive in one case, negative in two others and in the remaining two the results had not been recorded in the notes.

The ages of the children were $2\frac{8}{12}$, 4, 5, 5 and 10 years.

With these examples of strictly localised and healed tuberculosis it is of interest to compare similar cases which have been recorded elsewhere.

Among the cases investigated by the Royal Commission on Tuberculosis there were two children, aged 7 and $10\frac{1}{2}$ years respectively, who, having died from causes other than tuberculosis, showed at autopsy caseous or caseo-calcareous mesenteric glands which did not produce tuberculosis in guinea-pigs; the material in both instances showed numerous tubercle bacilli microscopically.

In two other Commission cases caseous glands removed by operation, though containing tubercle bacilli, did not produce tuberculosis in guinea-pigs. One of these patients was a boy aged 14 years and the gland an axillary gland. The other was a boy from whom material had been obtained on three separate occasions. On the first, when he was 14 months old, caseous cervical glands were removed and yielded a culture of bovine tubercle bacilli ; on the second and third occasions, when he was $2\frac{1}{2}$ and 5 years old, respectively, caseous cervical and inguinal glands glands did not infect guinea-pigs.

The latter is a clear example of recovery from a general infection with bovine tubercle bacilli.

Kossel, Weber and Heuss[1] found out of 39 cases of primary intestinal and mesenteric gland tuberculosis in children under 15 years 17 in which the tuberculosis, limited to the mesenteric glands, was healed, the caseous and calcareous lesions not producing tuberculosis in any of the guinea-pigs inoculated.

In eight of the 17 cases tubercle bacilli were found microscopically.

In this connection, and as affording additional evidence of tendency of tubercle bacilli not to remain latent but to perish in retrogressive lesions, attention may be drawn to Case 5—a boy aged $8\frac{1}{2}$ years who died of shock after an operation for tuberculous disease of the vertebræ and ileo-sacral joint. At the autopsy calcareous nodules were found in the mesenteric and the bronchial glands, emulsions of which did not infect guinea-pigs. Here is an example of arrest and cure of tuberculosis in one kind of tissue (glandular) and progression of tuberculosis in another kind of tissue (bony) less capable than glandular tissue of destroying the tubercle bacilli which have settled in it.

There is one other case (No. 39), worthy of mention here, in which the lesion was well advanced towards recovery. The tuberculosis was localised in the bronchial glands which were caseous and softened. There were numerous tubercle bacilli in the caseo-pus, but only one out of three guinea-pigs inoculated with it developed tuberculosis. The great majority of the bacilli were dead.

Cases which to the Naked Eye were not Tuberculous.

The bronchial and mesenteric glands of 33 children who showed at autopsy no macroscopic evidence of tuberculosis were tested on guinea-pigs for the presence of tubercle bacilli. In seven of these cases the cervical glands and in two the spleen were also tested. In one of two further cases the bronchial glands alone, and in the other the mesenteric glands alone were investigated. Observations have been made therefore upon the glands of 35 apparently not tuberculous children.

The following table gives the results of these tests :—

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[1] Reported by Dr. A. Weber. Die Infektion des Menschen mit den Tuberkelbazillen des Rindes (Perlsuchtbazillen). Dtsch. med. Wochenschr. 1906. Nr. 49. S. 1980.

Number of Case.	Age and Sex of Child.	Cause of Death.	Material inoculated.	Number of Glands used.	Number of Guinea-pigs inoculated.		Result in Guinea-pigs.
					Died prematurely.	Killed.	
12	$\frac{5}{12}$ year, male.	Broncho-pneumonia	Bronchial glands	4 or 5	3	—	—
			Mesenteric glands	10	3	—	—
16	$\frac{5}{12}$ year, male.	Meningitis (suppurative).	Bronchial glands	1 from each region.	1	2	No tuberculosis.
			Mesenteric glands	10	3	1	
13	$\frac{6}{12}$ year, female.	Marasmus ...	Bronchial glands	All	—	2	No tuberculosis.
			Mesenteric glands	10	—	3	
33	$\frac{8}{12}$ year, male.	Broncho-pneumonia.	Bronchial glands	6 to 7	1	2	No tuberculosis.
			Mesenteric glands	15	—	3	
35	$\frac{8}{12}$ year, female.	Broncho-pneumonia.	Bronchial glands	Majority	1	2	No tuberculosis.
			Mesenteric glands	14	—	3	
37	$\frac{8}{12}$ year, male.	? Meningitis ...	Bronchial glands	All	—	2	No tuberculosis.
			Mesenteric glands	14	—	3	
			Cervical glands ...	4	—	1	
			Spleen	—	—	1	
			Lung	—	—	1	
26	$\frac{9}{12}$ year, female.	Diphtheria ...	Bronchial glands	Majority	—	3	No tuberculosis.
4	1 year, female.	Encephalitis and enteritis.	Bronchial glands	All	—	2	No tuberculosis.
			Mesenteric glands	Majority	—	4	
42	1 year, male.	?	Bronchial glands	All	—	2	No tuberculosis.
			Mesenteric glands	10 to 12	1	2	
			Cervical glands ...	3	—	1	
32	$1\frac{3}{12}$ year, male.	Broncho-pneumonia.	Bronchial glands	4	—	3	No tuberculosis.
			Mesenteric glands	12	—	3	
63	$1\frac{8}{12}$ year, male.	Measles and broncho-pneumonia.	Bronchial glands	Portions of several.	2	1	No tuberculosis.
			Mesenteric glands	18	—	3	
11	$1\frac{9}{12}$ year, female.	Broncho-pneumonia.	Bronchial glands	Præ-tracheal only.	1	2	Both tuberculous.
			Mesenteric glands	Great majority.	2	3	Neither tuberculous.
30	$1\frac{10}{12}$ year, female.	Broncho-pneumonia.	Bronchial glands	Nearly all	3	1	No tuberculosis.
			Mesenteric glands	16 to 18	—	3	
6	2 years, female.	Diarrhœa ...	Bronchial glands	3	—	2	No tuberculosis.
			Mesenteric glands	16	2	2	
			Cervical glands ...	1	—	1	
22	2 years, male.	Broncho-pneumonia.	Bronchial glands	4	—	3	No tuberculosis.
			Mesenteric glands	About 20	—	3	
27	2 years, male.	Measles ...	Bronchial glands	4 or 5	—	3	No tuberculosis.
			Mesenteric glands	15	—	3	
36	2 years, male.	Septic scarlet fever.	Bronchial glands	Majority	1	3	No tuberculosis.
			Mesenteric glands	14	—	3	
			Cervical glands ...	3	—	2	
57	2 years, female.	Broncho-pneumonia.	Bronchial glands	Portions of several.	—	3	No tuberculosis.
			Mesenteric glands	14	2	2	
61	2 years, male.	Broncho-pneumonia.	Bronchial glands	4	—	3	No tuberculosis.
			Mesenteric glands	10	—	3	
64	2 years, female.	Broncho-pneumonia.	Bronchial glands	Portions of several.	—	2	No tuberculosis.
			Mesenteric glands	15	—	3	
17	$2\frac{4}{12}$ years, female.	Measles and broncho-pneumonia.	Bronchial glands	4	—	3	No tuberculosis.
			Mesenteric glands	12	—	3	

Number of Case.	Age and Sex of Child.	Cause of Death.	Material inoculated.	Number of Glands used.	Number of Guinea-pigs inoculated.		Result in Guinea-pigs.
					Died prematurely.	Killed.	
25	$2\frac{4}{12}$ years, male.	Empyema ...	Mesenteric glands	6	—	2	No tuberculosis.
65	$2\frac{9}{12}$ years, male.	Peritonitis ...	Bronchial glands	7	—	3	No tuberculosis.
			Mesenteric glands	20	—	3	
29	3 years, female.	?	Bronchial glands	6 or 7	1	3	No tuberculosis.
			Mesenteric glands	20	—	3	
3	$3\frac{8}{12}$ years, male.	Diphtheria ...	Bronchial glands	All from one side.	3	2	No tuberculosis.
			Mesenteric glands	5	2	—	
			Spleen	—	—	1	
10	4 years, female.	Hydrocephalus	Bronchial glands	All	—	2	No tuberculosis.
			Mesenteric glands	Majority	—	5	
50	4 years, female.	Septic scarlet fever.	Bronchial glands	6	—	3	No tuberculosis.
			Mesenteric glands	20	—	4	
15	5 years, female.	Measles and broncho-pneumonia.	Bronchial glands	Portions of all.	—	3	No tuberculosis.
			Mesenteric glands	8 + 1 ileo-colic.	—	3	
23	5 years, male.	Trauma ...	Bronchial glands	4 or 5	—	3	No tuberculosis.
			Mesenteric glands	15	—	4	
			Cervical glands ...	2	—	1	
28	5 years, male.	Coin in œsophagus.	Bronchial glands	3	—	3	No tuberculosis.
			Mesenteric glands	12	—	2	
			Cervical glands ...	2	—	2	
46	5 years, male.	Ptomaine poisoning.	Bronchial glands	Portions of several.	—	3	All three tuberculous.
			Mesenteric glands	16	—	3	None tuberculous.
56	5 years, female.	Whooping-cough and broncho-pneumonia.	Bronchial glands	Portions of 4.	—	3	No tuberculosis.
			Mesenteric glands	16	—	3	
24	7 years, female.	Burns ...	Bronchial glands	5	—	3	No tuberculosis.
			Mesenteric glands	14	—	3	
72	8 years, female.	Diphtheria ...	Bronchial glands	6	—	2	No tuberculosis.
			Mesenteric glands	10	—	3	
18	12 years, female.	Acute rheumatism and renal disease.	Bronchial glands	7 or 8	—	3	No tuberculosis.
			Mesenteric glands	15	—	4	
			Cervical glands ...	1	—	1	

In one instance all the guinea-pigs inoculated with both sets of glands died of an acute infection and in another all the guinea-pigs inoculated with mesenteric glands died prematurely. In several of the other cases one or more (but not all) guinea-pigs inoculated with a particular group of glands died.

Altogether 32 guinea-pigs died prematurely while 190 survived. Out of 72 groups of glands tested (exclusive of those in which all the guinea-pigs died prematurely) belonging to 34 children, only two produced tuberculosis in the guinea-pigs inoculated and in each instance it was the bronchial gland group.

The cultures isolated from each case exhibited the cultural characters and pathogenic properties of the human tubercle bacillus.

One of the children was aged one year nine months and died of broncho-pneumonia; the other was five years old and died of ptomaine poisoning.

The emulsion of the glands of one of these two cases had been treated with 2 per cent. antiformin before inoculation in order to kill the extraneous organisms which were present in large numbers. Since two other emulsions treated in precisely the same way did not cause tuberculosis in the guinea-pigs inoculated, the positive result after antiformin treatment is of value as suggesting that this percentage (2 per cent.) of antiformin is not high enough to destroy the capacity of an emulsion containing a few tubercle bacilli to produce tuberculosis in guinea-pigs. Antiformin in higher percentages (15 per cent. or more) has undoubted lethal action on tubercle bacilli as well as on other organisms and is an agent therefore which must be used with caution in experiments wherein it is sought to demonstrate living tubercle bacilli in tissues which, if untreated, might cause acute infections in the guinea-pigs.

It has been the experience of most observers who have made study of the distribution of tubercle bacilli in the human body to find in a certain proportion of their cases living tubercle bacilli in glandular tissues not recognisably tuberculous.

Weber and Baginsky[1] investigated the tonsils, cervical, bronchial and mesenteric glands of 26 children, of ages from 3 months to 12¼ years, who showed at autopsy no macroscopic evidence of tuberculosis, and demonstrated tubercle bacilli to be present in a single case, in the cervical glands of a child aged 2½ years; the bacilli were bovine tubercle bacilli. These authors give a comprehensive survey of the literature of this subject down to 1907; most of the investigators mentioned by them demonstrated (by guinea-pig inoculation) tubercle bacilli in glands not apparently tuberculous, but the type of bacillus was not determined.

Lydia Rabinowitsch[2] demonstrated (by guinea-pig inoculation) tubercle bacilli of the human type in the cervical and mesenteric glands of a child aged 14 months, who had died of broncho-pneumonia and showed at autopsy no sign of tuberculosis.

[3] Gaffky investigated material derived from autopsies of 300 children, 1 to 13 years old. Out of 264 apparently not tuberculous children, the glands from 30 gave positive results. The investigation was continued by Rothe[4], who examined material from 100 children up to 5 years of age. He obtained positive results in 5 out of 78 cases.

Ungermann[5] investigated material from 171 children and demonstrated latency in four cases; in three the bacilli isolated were "human" and in the fourth "bovine."

Karl Steffenhagen[6] tested the glands (mesenteric, bronchial and occasionally the cervical) of 9 infants under 11 months without obtaining one positive result.

While these investigations demonstrate conclusively that lymphatic glands in children who present no macroscopic evidence of tuberculosis may be harbouring living tubercle bacilli, they do not give information as to the length of time tubercle bacilli may remain latent, in the anatomical sense. For, as Weber and Baginsky point

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[1] Tuberkulose-Arbeiten a.d. Kais. Gesundheitsamte. Heft 7. 1907.

[2] Zur Frage latenter Tuberkelbazillen. Berlin. Klin. Wochenschr. 1907. Nr. 2, S. 35.

[3], [4], [5] Loc. cit.

[6] Untersuchungen über Säuglingstuberkulose. Tuberkulose-Arbeiten a.d. Kais. Gesundheitsamte. Heft 11. 1912.

out, the infection may have been recent and there may have been early tuberculous lesions present solely in those glandular tissues inoculated, which would therefore have escaped recognition even when histological examinations were undertaken.

As to Channel of Entry of the Bacilli of the Different Types.

The great majority of the tuberculous cases can be readily classified, according to the localisation of the oldest and most severe tuberculous lesions, in one or other of two groups; one in which these lesions are in the thorax, the other in which they are in the abdomen.

Of the 8 cases in which the intestines or mesenteric glands (in one pharynx as well) were the seats of the primary manifestations of the disease six were caused by bovine tubercle bacilli and two by human tubercle bacilli.

Of 22 cases in which the lungs or bronchial glands showed more extensive and more advanced caseation than any other organ or glands of the body the cause of the tuberculosis was in every instance the human tubercle bacillus. This class of tuberculosis has not to my knowledge ever been associated with the bovine type of tubercle bacillus.

While there can be no doubt but that the tubercle bacilli in the first class of case entered the body through the mucous membrane of the alimentary tract, it cannot be asserted with equal confidence that the invasion in the second group was by way of the respiratory tract.

Theoretically it is possible for the lungs or bronchial glands to be invaded primarily not only by tubercle bacilli which have been inhaled but also by bacilli which have been ingested, the bacilli in the latter case passing through the mucous membrane of the alimentary tract and the glands which lie along it and arriving in the lungs or regionary lymphatic glands by way of the lymph stream or possibly the blood stream.

There is experimental evidence, obtained from some feeding experiments performed by me for the Royal Commission on Tuberculosis in which the animals were killed shortly after they were fed, that ingested tubercle bacilli can pass directly from the alimentary tract to the lungs without producing lesions *en route*. But in these experiments large doses of bacilli were given and only few of the bacilli succeeded in getting through to the lungs, the majority being arrested in the glands (as was shown by the results of the inoculation of these tissues into guinea-pigs). Had the animals been allowed to live they would undoubtedly have displayed the ordinary anatomical pathological picture of ingestion tuberculosis.

In the very large number of the Commission's feeding experiments, in which the animals were allowed to live long enough to develop tuberculosis, there were only a few dogs which showed trivial lesions in the lungs and no signs of tuberculosis in the alimentary tract. But the dog is exceptional as regards behaviour towards tubercle bacilli, and there is no justification for assuming that general inferences could be drawn, from results obtained with this species, applicable to tuberculosis in other animals.

It is not, however, a question as to the effects of large doses. It is part of the hypothesis of the alimentary origin of phthisis that the bacilli pass through the mucous membrane of the alimentary tract

and associated glands without leaving trace of their passage. Therefore the dose must be a small one, otherwise there would be mesenteric gland lesions, and the case would be one of primary abdominal tuberculosis.

Is it possible in man for single bacilli which have passed through the alimentary mucous membrane to be carried with the lymph stream direct to the lungs and set up primary thoracic tuberculosis? Whilst experiments on animals have not provided a conclusive answer to this question, the following considerations which have arisen as a result of this study of anatomical distribution of disease in relation to type of infecting organism go, in my opinion, to support the view that direct infection of the thoracic organs by way of the alimentary tract is exceedingly infrequent.

A common form of fatal tuberculosis in childhood is that in which the disease is most severe in the thorax (primary in lungs or bronchial glands), and is caused by the human type of tubercle bacillus. If the portal of entry of the bacilli in these cases be the alimentary tract then human tubercle bacilli behave differently in the human body from bovine tubercle bacilli. For it is perhaps exclusively by way of the alimentary tract that the bovine tubercle bacillus gains access to the tissues of children, yet there is no recorded instance in childhood of primary thoracic tuberculosis due to the bovine tubercle bacillus, though bovine tubercle bacilli must frequently enter the alimentary tract and be absorbed from it in small numbers. (The argument is not invalidated by question of modification of the bovine into the human type, for unmodified bovine tubercle bacilli have frequently been isolated from the lungs and bronchial glands in cases in which the infection was unquestionably alimentary). There are no grounds for assuming that there is any difference of behaviour between the two types (an opinion also held by A. Weber, loc. cit.). On the contrary the evidence from cases of primary mesenteric gland tuberculosis in childhood and from experiment on the anthropoid ape and monkey show that human tubercle bacilli when absorbed from the alimentary tract behave in precisely the same way as bovine tubercle bacilli.

General Summary.

Material derived from autopsies of 73 children has been investigated with reference to the presence and distribution of tubercle bacilli, and to the type of tubercle bacillus isolated. The material examined was from children who had died of any cause whatsoever and there was no selection of cases.

The table which follows gives an analysis of the results.

Series of 65 deaths from all causes.

Age Periods.	Number of Cases.			Classification of Cultures isolated.		
	Free from T.B.	T.B. dead.	T.B. living.	Bovine.	Human.	Mixed bovine and human.
0–1 year ...	6	—	3	—	3	—
1–2 years ...	5	—	3	2	1	—
2–3 years ...	10	1	5	1	4	—
3–4 years ...	2	—	6	3	3	—
4–5 years ...	2	1	3	—	3	—
5–6 years ...	5	2	3	—	2	1
6–7 years ...	—	—	2	—	2	—
7–8 years ...	1	—	—	—	—	—
8–9 years ...	1	—	1	—	1	—
9–10 years ...	—	—	—	—	—	—
10–11 years ...	—	1	—	—	—	—
11–12 years ...	1	—	1	—	1	—
Total ...	33	5	27	6	20	1

Series of 8 cases from institutions where tuberculous cases alone were investigated.

1–2 years ...	—	—	1	—	1	—
2–3 years ...	—	—	1	—	1	—
3–4 years ...	—	—	1	—	1	—
4–5 years ...	—	—	1	—	1	—
5–6 years ...	—	—	2	—	2	—
9–10 years ...	—	—	1	—	1	—
10–11 years ...	—	—	1	—	1	—
Total ...	33	5	35	6	28	1

26 of the children died of tuberculosis (4 bovine, 21 human and one mixture) and of these 18 died of tuberculous meningitis; 12 children were tuberculous but died of other causes.

Clinical and Post-mortem Notes of the Tuberculous Cases and Bacteriological Results.

Case I.

Male child.

Age.—2½ years.

Cause of death.—Diphtheria and tuberculous meningitis.

Clinical notes.—The child was admitted to hospital with diphtheria, and then developed symptoms of meningitis. He was supposed to have died from meningitis—he had strabismus and all the classical signs of meningitis,—but very few tubercles were found on the meninges. He had been fed on the breast entirely till he was 2 years of age, and then for six months he had had unboiled cow's milk. There was no history of phthisis in the family. Four children had died between the ages of 1½ to 2 years of convulsions.

Post-mortem notes.—The lungs contained numerous grey miliary tubercles. The bronchial glands were enlarged and caseous. There were miliary tubercles in the spleen, liver and on the peritoneum, and there were a few in the Sylvian fissure. The mesenteric glands (about half a dozen were examined bacteriologically) were little, if at all, enlarged, but contained caseous tubercles up to 2 mm. in diameter.

Bacteriological investigation.—The tissues investigated were a portion of the lung and some of the mesenteric glands.

Separate emulsions were made from the lung and the mesenteric glands, and each emulsion was inoculated intraperitoneally into two guinea-pigs. Tubercle bacilli were very scanty in the emulsions, only one being found in the mesenteric gland emulsion after long search, and none in that from the lung.

Three of the four guinea-pigs were killed and one died, the duration of life being 21 to 30 days. All showed slight general tuberculosis. Cultures were obtained from each of the four guinea-pigs and each of the strains exhibited the cultural characters of the human tubercle bacillus. A lung strain and a mesenteric glands strain proved of low virulence for the rabbit.

Summary.

Male child, age 2½ years, died of tuberculous meningitis and general miliary tuberculosis during an attack of diphtheria. The most advanced lesions were in the bronchial glands.

Cultures from the lung and mesenteric glands exhibted the cultural characters and virulence for the rabbit of the human tubercle bacillus.

Case 2.

Male child.

Age.—4 years 8 months.

Cause of death.—Pulmonary tuberculosis.

Clinical notes.—The child had measles when 2 years 8 months old. The onset of the present illness was gradual, with drowsiness and languor. The sputum contained tubercle bacilli. There was no family history of tuberculosis.

Post-mortem notes.—Left lung: upper lobe solid and tough, posterior part collapsed, cavities at apex, one about the size of a filbert, another the size of a pea, miliary tubercles scattered throughout, walls of bronchial tubes reddened, softened and full of pus; lower lobe practically airless, substance presented honeycombed

appearance due to dilatation of small bronchi and bronchioles, numerous miliary tubercles. Right lung : broncho-pneumonia throughout and innumerable miliary tubercles. Bronchial glands enlarged, deeply congested, showed a caseous patch and an occasional tubercle or two. Pleural cavities free except for adhesion between left lung and diaphragm.

Intestines : numerous ulcers beginning two feet from pylorus, ulcers in caecum, appendix, colon and rectum.

Mesenteric glands contained discrete caseous nodules up to a hempseed.

There was miliary tuberculosis of all the other organs.

Bacteriological investigation.—The tissues investigated were the mesenteric and bronchial glands.

Direct cultures were sown from three caseous areas in the mesenteric glands and from two in the bronchial glands. Only one set of tubes from each group of glands remained uncontaminated and these produced no colonies of tubercle bacilli after $3\frac{1}{2}$ months' incubation.

Emulsions of the mesenteric (no tubercle bacilli found) and the bronchial gland (scattered slender tubercle bacilli) were inoculated each into two guinea-pigs. The two from the latter died within 24 hours of an acute infection. The former two were killed 25 days after inoculation and showed general tuberculosis.

Cultures of T.B. were raised from each of these two guinea-pigs and they exhibited the cultural characters of the human tubercle bacillus. One of the strains proved of low virulence for the rabbit.

Summary.

A case of pulmonary tuberculosis with secondary tuberculosis of the intestines and general miliary tuberculosis in a child aged 4 years 8 months. A culture derived from the mesenteric glands exhibited the cultural characters and virulence for the rabbit of the human tubercle bacillus.

Case 5.

Male child.

Age.—$8\frac{1}{2}$ years.

Cause of death.—Shock following an operation.

Clinical notes.—The boy died of shock after an operation for psoas abscess and tuberculous caries of the spine.

Post-mortem notes.—Numerous sinuses over lower lumbar vertebræ, sacrum, under Poupart's ligament on right side and one lower down on anterior part of thigh. Laminectomy wound broken down over lumbar vertebræ. Tonsils very much enlarged, crypts filled with foul-smelling yellow masses. The cervical glands adjacent appeared enlarged, but there was no sign of caseation ; one of the glands situated near the left hyoid was used for experiment. Mesenteric glands : two glands in the mesentery, about the middle, contained three calcareous nodules up to a pea in size ; the rest of the mesenteric glands were normal. Bronchial glands : the intertracheobronchial glands contained three irregular calcified nodules, the largest the size of a pea ; other bronchial glands were normal.

Lungs emphysematous, no tuberculosis. Liver fatty, but not amylaceous. Spleen showed perisplenitis. Kidneys normal. The 3rd and 4th lumbar vertebræ were collapsed and fibrosed over. There was recent necrosis of the whole of the sacrum. The right ileo-sacral joint and adjacent part of ileum were also necrosed.

Bacteriological investigation.—Tissues investigated were mesenteric bronchial and cervical glands.

Each of the two calcareous mesenteric glands was separately emulsified and inoculated into a guinea-pig. An emulsion of half a dozen normal looking glands from different regions of the mesentery was made and inoculated into another guinea-pig.

Two guinea-pigs were inoculated with an emulsion of the calcareous bronchial gland, and one with an emulsion of a cervical gland.

Direct cultures failed, and microscopical examination of the emulsions was negative.

Only one of the guinea-pigs developed tuberculosis, *i.e.*, the one inoculated with cervical gland.

From this guinea-pig a culture was raised which exhibited the cultural characters and virulence for the rabbit of the human tubercle bacillus.

Summary.

A boy, aged $8\frac{1}{2}$ years, who died of shock following operation for tuberculous caries of spine, showed calcareous nodules in mesenteric and bronchial glands.

Culture and inoculation experiments with nodules negative. A guinea-pig, however, inoculated with a cervical gland not apparently tuberculous developed tuberculosis, and a culture of human tubercle bacilli was isolated.

CASE 7.

Male child.

Age.—2 years.

Cause of death.—Suppurative meningitis.

Clinical notes.—The boy died of suppurative meningitis following double otitis media.

Post-mortem notes.—Brain large, convolutions flattened, a layer of pus present on most parts of surface; no abscesses on section; ventricles distended with clear fluid. Pus in both middle ears.

Lungs: the right showed fibrous consolidation of the upper lobe, except the anterior portion, which was emphysematous; on section the consolidated parts consisted of fibroid and airless lung tissue containing small cavities filled with caseous plugs which shelled out. In the midst of this solid tissue were found several small completely caseous glands. Left lung normal.

Bronchial glands: Those on the right side were the most severely affected; one, the size of a walnut and three others, that of a pea, were caseous throughout and in places broken down; another contained caseous patches. The intertracheo-bronchial and the left bronchial glands contained yellow caseous nodules and early grey tuberculous patches.

Mesenteric glands: Eight tuberculous glands were counted; two of these, the size of peas, were caseous practically throughout, the rest contained caseous patches of varying size up to a pea, majority beginning to soften in the centre. Spleen slightly enlarged, follicles well marked. Liver large and fatty. Cervical glands normal.

Bacteriological investigation.—Tissues investigated were the bronchial and mesenteric glands and a piece of the spleen.

Two guinea-pigs were inoculated from the right bronchial glands, two from the mesenteric glands and one from the spleen. The

guinea-pigs were killed or died in periods varying from 49 to 86 days and all showed general tuberculosis, which, in two, was very slight and in the others chronic, with little necrosis.

Tubercle bacilli were very scanty in the lesions, only two or three curved and irregularly beaded tubercle bacilli being found in the bronchial gland emulsion and one doubtful tubercle bacillus in one out of two smears from the mesenteric glands.

Cultures were raised from the bronchial and mesenteric glands and the spleen, in each case through the guinea-pig. Direct culture failed.

Each of the three strains displayed the cultural characters and virulence for the rabbit of the human tubercle bacillus.

Summary.

A male child, aged two years, who died of suppurative meningitis was found at autopsy to have pulmonary tuberculosis and tuberculosis of the bronchial and mesenteric glands.

Pure cultures of human tubercle bacilli were isolated from the bronchial and mesenteric glands and the spleen.

CASE 8.

Male child.

Age.—3 years.

Cause of death.—Tuberculous meningitis.

Clinical notes.—The child died of tuberculous meningitis after nine days' illness. No tubercle bacilli were found in cerebro-spinal fluid. There was no history of phthisis in the family.

Post-mortem notes.—The lungs contained fairly numerous discrete grey miliary tubercles. Bronchial glands: on the right side there was a mass of completely caseous breaking down glands the size of a walnut and one also caseous, but not breaking down, the size of a French bean; the intertracheo-bronchial glands contained discrete caseous tubercles; the glands on the left side appeared normal. Mesenteric glands: two in the middle of the mesentery were slightly enlarged and showed numerous caseous tubercles up to two mm., arranged around the cortices; two or three others contained each one or two caseous tubercles; others were normal. Two ileo-colic glands contained a number of discrete caseous tubercles. Cervical glands were normal.

Spleen: grey miliary tubercles and a few larger caseous tubercles.

Meninges: numerous grey tubercles.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands, lungs, spleen and meninges.

Guinea-pigs were inoculated with emulsions of the bronchial glands (2), ileo-colic glands (2), spleen (1), lung (1) and meninges (1). Numerous T.B. were found in the bronchial gland and meninges emulsions and a few in the mesenteric gland emulsion. The guinea-pigs died or were killed in 31 to 43 days and showed moderate tuberculosis.

Cultures were obtained direct from the mesenteric and bronchial glands and the spleen and through the guinea-pig from the ileo-colic glands, lung and meninges.

All the strains produced on the differential media the luxuriant growths which are characteristic of the human tubercle bacillus.

The three direct strains were tested on the rabbit. One (mesenteric gland strain) showed when killed after three months severe

tuberculosis of the lungs, the other developed only moderate or slight tuberculosis.

In order to ascertain whether the severe lung disease in the first mentioned rabbit was due to human or bovine tubercle bacilli, a culture was raised from the lung and inoculated subcutaneously into another rabbit. The recovered culture grew luxuriantly and produced only slight tuberculosis in a rabbit inoculated subcutaneously.

Summary.

A child, aged three years, died of tuberculous meningitis and showed at autopsy miliary tuberculosis of the organs and tuberculosis of the bronchial and mesenteric glands. The most severe and oldest lesions were in the bronchial glands.

Direct cultures from the mesenteric and bronchial glands and the spleen exhibited the cultural characters and the virulence of the human tubercle bacillus.

CASE 9.

Male child.

Age.— 2 years 8 months.

Cause of death.—Diphtheritic paralysis and broncho-pneumonia.

Post-mortem notes.—Lungs extensively consolidated throughout by patches of broncho-pneumonia ; many areas of emphysema ; no tuberculosis. The intertracheo-bronchial glands contained two caseous nodules, one the size of a hempseed, the other that of a pin-head ; one right bronchial gland contained a pin-head sized caseous tubercle ; other bronchial glands normal. Mesenteric glands normal. No sign of tuberculosis except in bronchial glands. Tracheotomy wound healed. Tonsils concave and completely healed. Congestion of upper aperture of larynx.

Bacteriological investigation.—Three guinea-pigs were inoculated with an emulsion of 12 mesenteric glands and two with emulsion of ileo-colic glands. One died prematurely ; the rest were killed after 59 days and were found to be healthy. Three guinea-pigs were inoculated with an emulsion of the two nodules from the intertracheo-bronchial glands and of some of the normal glands. Two died in 10 and 12 days respectively and cultures from various regions of one of them remained sterile ; the third was killed after 59 days and was found to be healthy.

Direct cultures from the caseous nodules remained sterile.

A smear-preparation from the nodules showed no tubercle bacilli.

Summary.

A child, aged 2 years 8 months, who died of broncho-pneumonia, showed caseous nodules in the bronchial gland.

Cultures and microscopical examination of the nodules were negative. Guinea-pigs inoculated with bronchial glands (including nodules) and mesenteric glands did not develop tuberculosis.

CASE 14.

Female child.

Age.—3 years 11 months.

Cause of death.—Tuberculous cerebro-spinal meningitis.

Clinical notes.—The child died of meningitis after a month's illness beginning with a convulsion. No notes obtained as to family history.

Post-mortem notes.—Lungs contained moderately numerous discrete miliary caseous tubercles and one pea-sized caseous and softened nodule. Bronchial glands : on the right side there was a group of much enlarged glands, two of which were caseous throughout and three beset with coalescing caseous tubercles ; on the left side the glands were only slightly enlarged, one contained several caseous tubercles, the other only a few ; the right intertracheo-bronchial gland was much enlarged and caseous throughout, the left contained discrete caseous tubercles. Mesenteric glands : normal in size, three showed altogether four caseous tubercles. Caseous tubercles in lumbar glands and coeliac glands. Liver substance showed submiliary granulation tubercles. Spleen : scattered, submiliary grey and a few larger caseous tubercles. Both kidneys contained a few miliary granulation tubercles.

Brain : gelatinous fibrinous infiltration of basal cisterns, slightly caseous adhesions in Sylvian fissures, miliary caseous tubercles on convexities chiefly on right side, slight hydrocephalus, submiliary tubercles in cauda equina. Muco-pus in both middle ears.

Bacteriological investigation.—Tissues investigated—bronchial and mesenteric glands, portions of lung and spleen.

Guinea-pigs were inoculated with emulsions of a right bronchial gland (2), a tuberculous mesenteric gland (2), half a dozen normal looking mesenteric glands (2), lung (1) and spleen (1). The latter died within 24 hours. The others were killed some in 44, the others in 61 days. All showed general tuberculosis.

Moderately numerous tubercle bacilli, mostly long, slender and beaded, were found in the bronchial gland emulsion while none were found in a smear from a tuberculous mesenteric gland.

Cultures were obtained from the bronchial gland direct and from the mesenteric glands (two strains, one from a tuberculous, the other from macroscopically non-tuberculous mesenteric glands), also from the lung through the guinea-pig. Each of these four strains exhibited the cultural characters of the human tubercle bacillus.

The bronchial gland, a mesenteric gland and the lung strains displayed low virulence for the rabbit.

Summary.

A child, aged 3 years and 11 months, died of tuberculous cerebro-spinal meningitis and showed at autopsy a primary nodule in the lungs, enlargement and caseation of the bronchial glands and general miliary tuberculosis.

Cultures from the lung, bronchial glands and mesenteric glands exhibited the cultural characters and the virulence of a human tubercle bacillus.

CASE 19.

Female child.

Age.—11 months.

Cause of death.—Broncho-pneumonia.

Clinical notes.—The child was stated to have had a weak chest from birth. The father and mother were alive and well, and there was no consumption in the family. There was one other child who was well.

Post-mortem notes.—Confluent lobular consolidation throughout nearly the whole of the left lung, most marked in upper lobe. Acute fibrinous pleurisy on left side. No tuberculous lesions were found

in the lungs. One inter-bronchial gland showed a doubtful focus ; the rest were normal.

The spleen pulp contained scattered caseo-purulent tubercles ranging in size from a point just visible up to a hempseed.

Shallow serpiginous ulcers on dorsum of tongue, mucous catarrh of stomach, thin slimy mucosa with atrophy of lymphoid tissue throughout small intestine. Mesenteric and ileo-colic glands normal. Anæmia with œdema of kidneys. Œdema of liver. Slight rickets of ribs.

Bacteriological investigation.—Tissues investigated—bronchial and mesenteric glands and spleen.

About a dozen of the mesenteric glands were emulsified and inoculated into three guinea-pigs. These, killed 43 days later, showed no tuberculosis. Four of the bronchial glands were emulsified and inoculated into two guinea-pigs, and the interbronchial gland with a doubtful focus was separately emulsified (no tubercle bacilli found) and inoculated into a single guinea-pig. The latter was healthy when killed 42 days later. One of the former two died in 30 days and showed no tuberculosis, the other killed 46 days after inoculation showed slight general tuberculosis, the omentum containing a few tubercles and the nearest glands being caseous. Several of the spleen tubercles were emulsified (no tubercle bacilli found in smear preparation) and inoculated into two guinea-pigs. Both were free from tuberculosis when killed 40 and 42 days later. Cultures sown from the nearest glands and the spleen of both the latter guinea-pigs remained sterile, thus proving that there were no attenuated mammalian or avian tubercle bacilli in the spleen tubercles of the child.

A culture was obtained from the tuberculous guinea-pig and this exhibited the cultural characters and virulence for the rabbit of a human tubercle bacillus.

Summary.

A child, aged 11 months, died of broncho-pneumonia and showed at autopsy some caseo-purulent foci in the spleen and a doubtful focus in a bronchial gland. Only one of the guinea-pigs inoculated with bronchial glands developed slight tuberculosis, and the culture isolated from it was of the human type. Guinea-pigs inoculated with spleen tubercles and mesenteric glands remained healthy.

CASE 20.

Female child.

Age.—4 years.

Cause of death.—Burns.

Clinical notes.—The child died soon after admission of burns. Six other children were alive and well. Father a labourer. There were no other notes.

Post-mortem notes.—The body showed burns of the first, second, and third degrees on left arm, left buttock and left leg. Lungs congested ; fibrous pleural adhesions on left side ; no tuberculosis. Bronchial glands normal. No sign of tuberculosis in liver, spleen, and kidneys.

Mesenteric glands : in the lower part of the mesentery there were two enlarged glands both of which were filled with a pultaceous greyish white soft caseous substance ; the walls of these glands were fibrous and showed the remains of trabeculæ internally ; other mesenteric glands were normal.

Bacteriological investigation. — Tissues investigated were the mesenteric and bronchial glands.

The caseous substance from one of the mesenteric glands was emulsified and inoculated into two guinea-pigs ; that from the other was used for cultures. No tubercle bacilli were found in smear preparations. An emulsion of 10 to 12 normal mesenteric glands was inoculated into two guinea-pigs. An emulsion of half a dozen bronchial glands was inoculated into three guinea-pigs.

The seven guinea-pigs were killed 52 days later and all were found to be free from tuberculosis.

The direct cultures became contaminated.

Summary.

A female child who died of burns showed two caseous and softened mesenteric glands.

Caseous substance from one of these glands as well as normal looking mesenteric and bronchial glands did not produce tuberculosis in guinea-pigs.

CASE 21.

Female child.

Age.—9 months.

Cause of death.—Tuberculous meningitis.

Clinical notes.—The present illness began with fits nine days before admission. She had had no infectious illness and no falls, but had had discharge from the left ear. There was no history of tuberculosis in the family.

Post-mortem notes.—Lungs closely beset with grey miliary tubercles ; similar tubercles on pleuræ. Bronchial glands : one intertracheo-bronchial gland on the right side was the size of a thrush's egg, and was caseous throughout ; one prætracheo-bronchial on same side, the size of a pea, was caseous throughout, another, the size of a kidney bean, showed earlier caseation. Small intestines showed throughout their whole length tuberculous follicles and small tuberculous ulcers. Mesenteric glands were not obviously enlarged, but a good many contained miliary caseous tubercles either singly or in groups. Spleen, liver, and kidneys contained numerous submiliary grey tubercles. There were submiliary tubercles on the left dome of diaphragm.

Brain and cord : gelatinous fibrin at base of brain with dense adhesions along adjacent fissures ; miliary tubercles on subarachnoid on both sides of fissures, some of them extending to the vertex and mesial surface of cerebral hemispheres ; internal hydrocephalus ; slight gelatinous subarachnoid thickening on posterior surface of spinal cord ; hydrorhachis.

Bacteriological investigation.—Tissues investigated were mesenteric and bronchial glands, and portions of lung, spleen, and meninges.

Emulsions of four tuberculous mesenteric glands and of right bronchial gland were inoculated each into two guinea-pigs ; emulsions of spleen and lung into one guinea-pig each. Microscopical examination showed scattered tubercle bacilli in mesenteric gland, fairly numerous tubercle bacilli in bronchial gland.

The guinea-pig inoculated with spleen died in two days. The remaining five were killed or died in 47 to 52 days, and all showed general tuberculosis, not very severe.

Direct cultures from a spleen tubercle and a caseous bronchial gland were negative. Cultures were obtained from each one of the five tuberculous guinea-pigs, and three of the strains (derived from mesenteric and bronchial glands and lung) were tested on the differential media. All exhibited the cultural characters of the human tubercle bacillus. A mesenteric and a bronchial gland strain were shown to possess low virulence for the rabbit.

Summary.

A child, aged nine months, who died of tuberculous meningitis showed at autopsy general miliary tuberculosis and enlargement and extensive caseation of the bronchial glands.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 31.

Male child.

Age.—5 years.

Cause of death.—Tuberculous meningitis.

Clinical notes.—As a child he had been breast-fed for three months only. There was no family history of consumption. No other notes had been obtained.

Post-mortem notes.—Intestines: small scars with no visible tubercles and no peritoneal adhesion in uppermost part of ileum; similar scar in part of Peyer's patch a few inches beyond this. Mesenteric glands: six of the glands contained hard irregular calcareous nodules up to a hempseed in size; the rest appeared normal; there were nodules also in the ileo-colic glands. Lungs: caseo-calcareous and softened caseous tubercle of collapsed right middle lobe; dense fibrous pleural adhesions over both other lobes; a few miliary granulation tubercles scattered throughout both lungs. Bronchial glands: four of the left prætracheo-bronchial glands were enlarged up to a French bean; they were very hard and composed throughout of completely calcified substance; the two inter-tracheo-bronchial glands were enlarged and composed of calcareo-caseous substance; the right bronchial glands were normal. Sub-miliary granulation tubercles visible in liver. A very few tubercles in right kidney. Left kidney: caseous cavity in apex communicating with pelvis; numerous miliary tubercles throughout; caseous tubercle of left ureter; tubercle of bladder around orifices of ureters. Miliary and submiliary granulation tubercles in brain and meninges, especially over mesial surfaces of frontal lobes and in Sylvian fissures; very slight hydrocephalus. No tubercles in cervical, axillary, cœliac, lumbar, and inguinal glands, nor in epididymes.

Bacteriological investigation.—The mesenteric gland nodules were emulsified and inoculated into two guinea-pigs. A smear preparation of the emulsion showed no tubercle bacilli. The guinea-pigs killed six weeks later were found to be healthy, and cultures from the nearest glands of one and the spleen of the other were negative.

The bronchial gland nodules were emulsified and inoculated into two guinea-pigs; a smear preparation of the emulsion showed two degenerate tubercle bacilli. One guinea-pig (No. 621) died in 10 days; cultures were sown from its omentum and pyloric gland, and one colony of tubercle bacilli was obtained from the omentum. The

other guinea-pig (No. 622) was killed 31 days after inoculation and showed slight general tuberculosis; cultures were obtained from its spleen and sternal gland.

A small portion of meninges was emulsified and inoculated into one guinea-pig; microscopically the emulsion showed a few tubercle bacilli. The guinea-pig died in nine days of a sub-acute infection, and cultures from it became contaminated.

Some of the original meninges emulsion had been preserved but it had decomposed. It was therefore treated with antiformin before inoculation into another guinea-pig. This guinea-pig did not develop tuberculosis. The tubercle bacilli had died, probably as a result of the decomposition of the emulsion.

A scraping from the internal surface of a portion of the bladder which had been preserved in Müller's fluid showed a moderate number of tubercle bacilli, of medium length and slightly beaded.

The culture from guinea-pig 621 was dysgonic and produced rapidly fatal tuberculosis in rabbits, behaving in these respects like a standard bovine tubercle bacillus.

The culture (spleen strain) from guinea-pig 622 was in its early generations eugonic, producing on glycerin agar and potato the luxuriant growths characteristic of the human tubercle bacillus. It was, however, as virulent for rabbits as the guinea-pig 621 strain. The sternal gland strain was dysgonic and fully virulent for rabbits.

The virulent element of the eugonic strain was obtained in pure (dysgonic) culture by passage through the body of the rabbit.

That only one out of three virulent strains isolated from guinea-pigs inoculated with the same material contained an admixture of human tubercle bacilli may be explained on the assumption that living human tubercle bacilli were present in very small numbers in the original material, the bronchial glands of the child.

As cultures were not secured from lesions which brought about the death of the child it is impossible to say which of the two types of tubercle bacillus demonstrated to be present in the bronchial glands was the cause of the death of the child.

Summary.

A child, aged 5 years, who died of tuberculous meningitis showed at autopsy calcareous bronchial and mesenteric glands, caseo-calcareous tuberculosis of right middle lobe of lungs, renal and vesical tuberculosis and general miliary tuberculosis.

Three strains of culture were isolated from two guinea-pigs inoculated with bronchial gland emulsion. Two of these were pure cultures of bovine tubercle bacilli and one was a mixed culture of human and bovine tubercle bacilli.

Guinea-pigs inoculated with mesenteric gland nodules did not develop tuberculosis.

CASE 34.

Female child.

Age.—5 years.

Cause of death.—Tuberculous peritonitis and plastic pericarditis.

Clinical notes.—The child was admitted to hospital with pleurisy. Two months before death she developed ascites so badly that it was necessary to operate, and the omentum was stitched to the abdominal wall. It was then seen that there was a tubercle nodule in the liver. After the operation she grew rapidly worse and died of general tuberculosis.

Post-mortem notes.—The lungs according to the notes supplied showed miliary tuberculosis. The bronchial glands in each region were much enlarged and on section were seen to be composed of fairly firm opaque creamy white caseated substance. Large intestine ulcerated.

Mesenteric glands: in the piece of mesentery bacteriologically examined there were half a dozen glands which were slightly enlarged and contained caseous nodules up to a pea in size. The mesentery and a piece of attached gut were covered with yellowish grey miliary tubercles. Spleen contained scattered submiliary tubercles. Liver (piece of) pale, no definite tubercles.

Bacteriological investigation.—The tissues investigated were the mesenteric and bronchial glands.

Emulsions of mesenteric and bronchial glands were inoculated each into three guinea-pigs. One out of each group was killed 30 days after inoculation, the other two 47 days after inoculation.

The three mesenteric glands and two of the bronchial gland guinea-pigs showed slight general tuberculosis. The third bronchial gland guinea-pig was healthy. The latter had received a very small dose of emulsion. A guinea-pig inoculated with emulsion of spleen died 18 days later, and showed no sign of tuberculosis.

Direct cultures from the mesenteric and bronchial glands were negative, but cultures were raised from them through the guinea-pig.

Both strains grew luxuriantly on artificial media and displayed low virulence for the rabbit.

Summary.

A case of general tuberculosis in a female child, aged 5 years, who died after an operation for ascites.

Cultures derived from tuberculous mesenteric and bronchial glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 38.

Female child.

Age.—5 years.

Cause of death.—Osteo-myelitis and pyæmia.

Clinical notes.—The child was admitted to hospital moribund and died of pyæmia and osteo-myelitis. There were no other clinical notes.

Post-mortem notes.—The periosteum of lower half of left femur was separated by thin hæmorrhagic pus. Abscess in metaphysis over inner condyle and outer condyle close to periosteal attachment. Patchy purulent infiltration of marrow of lower two-thirds of femur. Small pyæmic abscesses in heart muscle and throughout both lungs. Hyperplasia of pharyngeal tonsils, cervical glands and lymphoid tissue throughout intestines. Slight adenoids. Mesenteric glands: in the quarter segment of mesentery near the ileo-colic glands there was a group of four calcareous glands; one was the size of a runner bean and was filled with partly broken down calcareous substance; the other three were dry and stony hard; other mesenteric glands were normal in size and appearance. Bronchial glands normal.

Bacteriological investigation.—The three stony hard glands and portions of the broken down calcareous gland were emulsified and inoculated into two guinea-pigs. Eight to ten of the normal looking mesenteric glands, including one ileo-colic gland, were made into an emulsion and half of it was inoculated into two guinea-pigs. The

bronchial glands were emulsified and three quarters of the emulsion inoculated into guinea-pigs. Three cervical glands were emulsified and half the emulsion inoculated into one guinea-pig. The eight guinea-pigs were killed 60 days later and found to be free from tuberculosis.

Cultures from the large calcareous gland became contaminated.

Summary.

A child, aged five years, who died of pyæmia, showed at autopsy some calcareous mesenteric glands and no sign of tuberculosis elsewhere. Neither the calcareous substance nor normal looking mesenteric and bronchial glands produced tuberculosis in guinea-pigs.

CASE 39.

Female child.

Age.—6 years.

Cause of death.—Acute pneumonia and peritonitis.

Clinical notes.—There was no history of tuberculosis in the family.

Post-mortem notes.—The lungs showed lobar pneumonia. The intertracheo-bronchial glands were fused together to form a mass the size of a broad bean; on section this was found to be composed almost throughout of caseo-purulent substance. Other bronchial glands were normal. Mesenteric glands: these were normal in size and general appearance, and there was no sign of tuberculosis in them. Spleen and other organs normal to the eye.

Bacteriological investigation.—The pus from the bronchial gland was emulsified and used to inoculate three guinea-pigs. A smear preparation showed a moderate number of tubercle bacilli mostly short and slender, a few beaded and curved.

One of the three guinea pigs was killed 57 days after inoculation and showed slight tuberculosis of the omentum and slight general tuberculosis. The other two, killed 62 days after inoculation, were free from tuberculosis.

Four guinea-pigs inoculated with an emulsion of 13 mesenteric glands were healthy when killed 62 days after inoculation, as was also one guinea-pig inoculated with emulsion of spleen. A culture was isolated from the spleen of the tuberculous guinea-pig. The culture grew luxuriantly on artificial media and was of low virulence for the rabbit.

Summary.

A child, aged 6 years, who died of pneumonia, showed at autopsy caseous bronchial glands and no sign of tuberculosis elsewhere. The caseous substance produced tuberculosis in one out of three guinea-pigs, and a culture isolated from the tuberculous guinea-pig exhibited the cultural characters and virulence of a human tubercle bacillus.

CASE 40.

Female child.

Age.—2 years 2 months.

Cause of death.—Tuberculous cerebro-spinal meningitis.

Clinical notes.—The onset of the illness which ended in the death of the child was three weeks before admission with drowsiness. There was no history of consumption.

Post-mortem notes.—Miliary granulation tubercles throughout both lungs and on visceral pleuræ ; conglomerate caseous miliary tubercles in posterior part of right upper lobe. Bronchial glands enlarged and caseous, caseous mass in tracheal bifurcation 2·5 cm. across. Small caseous area in one right deep cervical gland. Minute shallow ulcers on dorsum of tongue. Sparsely scattered tuberculous ulcers in intestines and cæcum. Large caseous cœliac glands. Caseous areas in upper lumbar glands. Small caseous tubercles in mesenteric glands; one focus was the size of a hempseed, the others that of a millet seed. Granulation and caseous tubercles throughout liver and spleen. Miliary granulation tubercles in kidneys. Brain : gelatinous thickening in basal cisterns with dense adhesions along Sylvian fissure and between frontal lobes ; submiliary subarachnoid tubercles between frontal lobes; gross internal hydrocephalus with marked œdema of brain ; slight gelatinous thickening on posterior surface of spinal cord ; hydrorhachis.

Bacterological investigation.—The material investigated was a bronchial gland and some of the mesenteric glands.

An emulsion of caseous substance from the bronchial gland was inoculated into three guinea-pigs. A smear preparation of the emulsion showed a few slender tubercle bacilli. These guinea-pigs were killed 59 days after inoculation and showed chronic general tuberculosis.

An emulsion of tuberculous mesenteric glands was inoculated into three guinea-pigs ; no tubercle bacilli were seen in a smear of the emulsion.

The guinea-pigs died or were killed 35 and 59 days after inoculation and showed slight general tuberculosis.

Cultures were obtained from the bronchial gland direct and from the mesenteric gland through the guinea-pig.

Both strains grew luxuriantly on artificial media and were shown to possess low virulence for the rabbit.

Summary.

A child, aged 2 years 2 months, who died of tuberculous cerebro-spinal meningitis, showed at autopsy general miliary tuberculosis and much enlarged caseous bronchial glands.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 41.

Female child.

Age.—3 years.

Cause of death.—Tabes mesenterica.

Clinical notes.—None obtainable.

Post-mortem notes.—The piece of intestine examined showed two small irregular ulcers close together ; they seemed to be slightly caseous around the edges. All the glands in the piece of mesentery investigated were enlarged, the largest being about 1·5 cm. in greatest diameter, and the great majority were composed throughout of dense opaque white uniformly caseated substance; most of the remaining glands were partly caseous. The small pieces of lung examined were congested and partly consolidated, and seemed to contain numerous miliary tubercles, greyish and yellowish. In the margin of one of the pieces near the root of the lung several small cavities were seen (up to 1 cm.) with a yellow purulent lining (tubercle bacilli scanty).

Bronchial glands were enlarged, congested, firm and had a greyish appearance which on close inspection was seen to be due to grey tubercles. It was stated that there was no sign of tuberculosis anywhere else in the body.

Bacteriological Investigation.—An emulsion of caseous mesenteric glands was inoculated into three guinea-pigs and a rabbit. No tubercle bacilli were seen in two smear preparations of this emulsion. One of the guinea-pigs was killed 20 days after inoculation and showed slight general tuberculosis; the other two were killed 55 days after inoculation and showed chronic general tuberculosis, there being great enlargement and extensive caseation of lymphatic glands. Three guinea-pigs and a rabbit were inoculated with an emulsion of bronchial glands and two guinea-pigs with emulsion of lung. The three former and one of the two latter guinea-pigs died in 20 to 43 days of general tuberculosis; the other one died prematurely. The two rabbits died of typical "bovine" tuberculosis in 97 and 59 days.

Cultures were obtained from the mesenteric and bronchial glands and the lung, in each case through the guinea-pig. Direct cultures from the mesenteric glands remained sterile.

All the strains were dysgonic, exhibiting the cultural characters of a bovine tubercle bacillus.

The mesenteric and bronchial gland strains produced in rabbits rapidly fatal general tuberculosis identical with that set up by standard bovine tubercle bacilli.

Summary.

A case of tabes mesenterica in a female child, aged 3 years. Cultures isolated from the mesenteric and bronchial glands exhibited the cultural characters and virulence of a bovine tubercle bacillus.

CASE 43.

Female child.

Age.—6 years.

Cause of death.—Tuberculous meningitis.

Clinical notes.—The present illness began three weeks before admission with pains in the head, following a blow. There were no previous illnesses. The father and mother were alive and well and there was no consumption in the family. Two other children were alive and well; four were dead, one of meningitis, one of peritonitis and two of fits.

Post-mortem notes.—Lungs œdematous and congested, beset with grey miliary tubercles. Organising tuberculous fibrinous pleurisy on right and left sides, most marked on right. The right præ-and intertracheo-bronchial glands were enlarged and caseating throughout; on the left side two small ones were in a state of early caseation throughout. The jejunum showed a tuberculous ulcer and there was a small shallow ulcer in a Peyer's patch 7 inches above the ileo-cæcal valve. Mesenteric glands: half a dozen in the terminal quarter of the mesentery were enlarged up to a large pea and were caseous practically throughout; in the rest of the mesentery three caseous glands were found, two being about the middle; the ileo-colic glands were also affected. The mesentery, particularly the lower half, was covered with grey miliary tubercles and there was general tuberculous peritonitis. Muco-pus in tonsillar crypts. Spleen showed an anæmic infarcted area and scattered caseous and grey tubercles. Submiliary tubercles in both kidneys and in the liver.

There were small areas of conglomerate miliary tubercles in cervical glands on both sides and small caseous areas in lower œsophageal glands. Thyroid gland contained submiliary tubercles.

Brain: slight gelatinous thickening in basal cisterns with slight gelatinous adhesions along fissures; a few submiliary tubercles of superior surface of cerebellum and on under surface of occipital lobes; slight internal hydrocephalus; slight gelatinous thickening on posterior surface of spinal cord.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands and pieces of lungs and spleen. Emulsions of caseous mesenteric and caseous bronchial glands were inoculated each into three guinea-pigs; emulsions of spleen and lung into one each. Two out of each of the two sets of three guinea-pigs died 29 to 34 days later; all the remaining ones were killed 51 and 52 days after inoculation. All the guinea-pigs were tuberculous, the disease in some being slight, in others of moderate severity only. Two or three tubercle bacilli were found in the emulsion of mesenteric gland, none in that of bronchial gland.

Cultures were obtained from the mesenteric glands direct and from the bronchial glands direct and through the guinea-pig. Each of the strains grew luxuriantly on artificial media and produced only slight tuberculosis in the rabbit.

Summary.

A child, aged six years, who died of tuberculous meningitis, showed at autopsy general miliary tuberculosis and caseation of bronchial and mesenteric glands, most extensive in the former.

Cultures from the bronchial and the mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 44.

Male child.

Age.—5 years.

Cause of death.—Tuberculous meningitis.

Clinical notes.—The child was admitted to hospital on December 10th, 1912, with cerebral headache and vomiting, and died 6 days later. His present illness dated from October, 1911, when he was attacked with bronchitis, which lasted 7 months. When 3 months old he had measles. His eyes had been "weak" from birth. Three other children were alive. One other had died of meningitis. The mother had heart disease.

Post-mortem notes.—Lungs: in the right lower lobe there was a firm caseous mass 1·5 cm. in diameter, through the centre of which ran a bronchus filled with tenacious mucus. The rest of the lung contained miliary grey tubercles in moderate numbers. Bronchial glands: the inter-bronchial glands draining that part of the lung containing the caseous nodule were enlarged and caseous; the right bronchial and intertracheo-bronchial glands were enlarged, up to a filbert, and were composed throughout of yellowish white caseated substance; one left bronchial gland was a little enlarged and showed early caseation. The intestines showed tuberculous ulceration, and there was tuberculosis of diaphragm and peritoneum. Mesenteric glands: one contained a hempseed sized caseous softening nodule; one or two others showed grey cortical tubercles; the rest were normal. The spleen contained scattered caseous tubercles up to a millet seed. Scattered tubercles in cortices of each kidney.

Tubercles in liver. The cervical glands which I examined were normal, but according to the pathologist's notes some contained tubercles.

Brain : caseous tuberculous tumours in cerebrum and cerebellum ; tuberculous meningitis.

Bacteriological investigation.—Tissues investigated were lung, bronchial and mesenteric glands.

Separate emulsions were made from the lung nodule, a small right bronchial gland and the caseous mesenteric gland nodule, and each was inoculated into two guinea-pigs. A single guinea-pig was inoculated with emulsion of four spleen tubercles. A few tubercle bacilli were found in the lung and bronchial gland emulsions. One of the mesenteric gland guinea-pigs died of general tuberculosis in 51 days ; the others were killed 51 to 56 days after inoculation, one showing chronic, the others slight general tuberculosis.

Cultures were obtained from the lung, bronchial gland, mesenteric gland and spleen through the guinea-pig. Direct cultures were negative.

The last three strains were tested on artificial media and produced the luxuriant growths of the human tubercle bacillus. The same strains were tested on the rabbit and proved of low virulence.

Summary.

A child, aged 4 years, who died of tuberculous meningitis showed at autopsy general miliary tuberculosis, a primary focus in the lung and secondary bronchial gland and intestinal tuberculosis.

Cultures from the bronchial and mesenteric glands and the spleen exhibited the cultural characters and the virulence of the human tubercle bacillus.

CASE 45.

Female child.

Age.—3 years.

Cause of death.—Tuberculous meningitis.

Clinical history.—In October, 1912, she had measles which was followed by wasting. In December she had pain in front of chest. She was admitted to hospital and died on December 16th, 1912. Mother and father alive and well. Two other children delicate but fairly well. No family history of phthisis.

Post-morten notes.—The intestines were said to have been normal. In the lower quarter of the mesentery there was a group of about six enlarged glands which had become fused together. They contained caseo-pus and breaking down caseous substance. The rest of the mesenteric glands were normal. Retroperitoneal glands caseous and softened. Lungs contained scattered grey miliary tubercles. Two bronchial glands showed each one caseous tubercle ; the rest were normal. The spleen contained numerous grey miliary tubercles with caseous centres. The kidneys showed scattered grey tubercles. Cervical glands normal.

Brain : well-marked flattening of the convolutions without distension of lateral ventricles ; marked exudation at base in the Sylvian fissure and over upper surface of cerebellum ; in latter situation granular tubercles seen. Muco-pus in both ears.

Bacteriological investigation.—The tissues investigated were the mesenteric and bronchial glands and a piece of the spleen.

Two guinea-pigs were inoculated each with an emulsion of a different caseous mesenteric gland, two with emulsion of bronchial

gland, and two with emulsion of spleen. Microscopically the mesenteric gland emulsion showed two or three short tubercle bacilli while the spleen emulsion showed one moderately long one. The two mesenteric gland guinea-pigs and one of the bronchial gland guinea-pigs died in 33 to 38 days and showed slight general tuberculosis; the others were killed after 56 days and showed general tuberculosis of moderate severity. A rabbit inoculated subcutaneously with mesenteric gland emulsion showed after 97 days a local lesion and one tubercle in the lungs only.

Cultures were obtained from the mesenteric glands direct and from the bronchial glands and spleen through the guinea-pig.

The mesenteric and the bronchial gland strains grew luxuriantly on artificial media and were shown to possess low virulence for the rabbit.

Summary.

A case of general miliary tuberculosis of intestinal origin in a child, aged 3 years, who died of tuberculous meningitis.

Cultures from the mesenteric and bronchial glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 47.

Female child.

Age.—10 years.

Cause of death.—Pulmonary and general tuberculosis.

Clinical history.—When she was a year old she had tonsillitis and bronchitis, which were followed by enlarged glands of the neck. Since then she has always suffered from chest trouble. At 3 years she had measles and at 10 years chicken-pox. She was admitted to hospital in December, 1912. She had been expectorating for 6 months, the cough getting gradually worse, and the throat had been ulcerated for a month. She died 8 days after admission.

There was no family history of tuberculosis, father and mother and rest of family being alive and well.

Post-mortem notes.—Lungs: a few adhesions, chiefly recent, over lower lobes; much interstitial emphysema of mediastina and lungs; on section lungs on both sides presented typical honeycombed appearance with dilated bronchioles and small cavities containing purulent material; intervening tissue thickly studded with miliary tubercles; at the left apex there was a small smooth-walled old cavity, size of a cobnut, and in both upper lobes there was definite tissue destruction in neighbourhood of larger bronchi. The condition did not suggest to the pathologist a recent sudden dilatation due to interstitial emphysema but rather a chronic dilatation of bronchioles thickened and softened by infiltration. Bronchial glands: on one side there was a large caseous and softened mass, and in its neighbourhood a small gland, part of the cortex of which was caseous. The glands on the other side and the intertracheo-bronchial glands were enlarged but were not caseous. Intestines: in the ileum and ascending colon numerous typical tuberculous ulcers with peritoneal tubercles and infiltrated lymphatic channels stretching away from them. Mesenteric glands: two were found to contain each a minute caseous tubercle; another contained a softened caseous nodule rather less than a hempseed in size. Liver showed capsular tubercles and early tuberculous cholangitis. Spleen: tubercles on the surface and one caseous tubercle in the depth. A few caseous tubercles in the pyramids of the kidneys. Both tonsils ulcerated away. Lateral pharyngeal walls

corrugated with ulceration. Epiglottis, arytenoids, and base of tongue thickened and infiltrated with small ulcers. Cervical glands much enlarged, a few caseous points seen in them.

Bacteriological investigation.—Material investigated was the bronchial and mesenteric glands and the spleen. Emulsions of the large caseous bronchial gland, the tuberculous mesenteric glands and the spleen were inoculated each into two guinea-pigs. Numerous tubercle bacilli, the majority of medium length and beaded, were found in the bronchial gland emulsion. One of the guinea-pigs died prematurely. All the others showed general tuberculosis when examined 29 to 41 days after inoculation.

Cultures were obtained from the bronchial gland and from the mesenteric glands through the guinea-pig.

The two strains grew luxuriantly on the differential media and exhibited low virulence for the rabbit.

Summary.

A case of pulmonary and general tuberculosis in a child aged 10 years; there was severe secondary ulceration of the mucous membrane of the alimentary tract.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 48.

Female child.

Age.—10 years.

Cause of death.—Heart failure, acute and chronic peri- and endocarditis.

Clinical notes.—Admitted with three weeks' cough, vomiting and diarrhœa. There was no history of tuberculosis in the family.

Post-mortem notes.—Acute fibrino-plastic and chronic pericarditis. Acute and chronic endocarditis. Mesenteric glands: in the middle of the mesentery there was a mass of enlarged glands nearly the size of a hen's egg. On section the glands were surrounded by fibrous capsules and most of them were filled with a creamy pus; others contained caseo-pus and calcareous masses. The ileo-colic glands contained a few caseous tubercles. Bronchial glands enlarged, congested and pigmented. Except in the mesenteric glands there was no sign of tuberculosis in the body.

Bacteriological investigation.—The tissues investigated were the mesenteric and bronchial glands. A good quantity of pus and calcareous masses from the tuberculous mesenteric glands were emulsified (no tubercle bacilli found). Three-quarters of the emulsion were treated with 2 per cent. antiformin for about 20 minutes and then inoculated into three guinea-pigs; the other quarter was inoculated into a single guinea-pig without antiformin treatment. An emulsion of the bronchial glands was treated with 2 per cent. antiormin for half an hour before inoculation into three guinea-pigs. One of the latter died in 25 days. All the others were killed 46 days after inoculation. None showed any sign of tuberculosis.

Summary.

A child, aged 10 years, who died of heart disease showed at autopsy caseous and softened mesenteric glands and no sign of tuberculosis elsewhere.

Emulsions of the caseous substance and of the bronchial glands did not produce tuberculosis in guinea-pigs.

CASE 49.

Male child.

Age.—8 months.

Cause of death.—Tuberculous cerebro-spinal meningitis.

Clinical notes.—Onset with vomiting after blow on head. Father and mother alive and well; history of consumption on father's side. Six other children alive and well. Three others died of bronchitis and wasting; two others died of wasting and one other of convulsions.

Post-mortem notes.—Lungs: recent softened caseous cavity communicating with bronchus in left upper lobe; fibrotic caseous miliary tubercles throughout both lungs. Bronchial glands: large softened caseous glands on anterior surface of left bronchus; the left inter-tracheo-bronchial gland was enlarged and in a state of early caseation throughout; the right bronchial glands contained caseous tubercles. There were fibro-caseous tubercles in left cervical, left angular and cœliac glands. Two mesenteric glands were appreciably enlarged, and contained caseous foci and small patches; in four other glands there were altogether five miliary caseous tubercles. Numerous granulomatous miliary tubercles throughout liver and spleen. A few tubercles in the kidneys. Sub-miliary granulation tubercles in Sylvian fissures, on mesial surface of frontal lobes, on left temporal lobe and on cauda equina. Severe internal hydrocephalus.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands, portions of the lungs, spleen and meninges.

Guinea-pigs were inoculated with emulsions of the bronchial glands (2), mesenteric glands (2), lung (1), and spleen (1).

Smear preparations of the bronchial and mesenteric gland emulsions showed moderately numerous tubercle bacilli, mostly beaded and of medium length.

The guinea-pigs died or were killed 33 to 41 days after inoculation and all showed general tuberculosis.

Cultures were obtained from the bronchial and mesenteric glands and the lung through the guinea-pig.

All the strains grew luxuriantly on artificial media, and the bronchial and mesenteric gland strains displayed low virulence for the rabbit.

Summary.

A case of general miliary tuberculosis primary in the lung in a child aged 8 months, who died of tuberculous cerebro-spinal meningitis.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of a human tubercle bacillus.

CASE 51.

Female child.

Age.—3 years.

Cause of death.—Tuberculous cerebro-spinal meningitis and general disseminated tuberculosis.

Clinical notes.—Measles seven weeks ago; vomiting two weeks before admission; she has been liable to fits since 3 months old. There was a history of consumption on the father's side, father and mother alive and well. Three children; one died at 4 months of "consumptive" tonsils and convulsions; second child the patient; third child alive and well.

Post-mortem notes.—Intestines ; a considerable number of miliary submucous tubercles and a few erosions in jejunum and ileum ; a few erosions in cæcum. Mesenteric glands : in the upper part of the mesentery 10 to 12 glands were enlarged and caseous throughout ; four of the largest glands, largest 1·5 cm. in diameter, were softened around the periphery, and the whole caseous part of the gland could be shelled out *en masse* from its capsule ; the smaller glands were composed of firm caseated tissue ; other mesenteric glands normal. Coeliac, pancreatic, and lumbar glands were caseous. Lungs : miliary granulation tubercles throughout both. Bronchial glands, not enlarged, contained a few tubercles. A few granulation tubercles on parietal pleura. A few tubercles in tracheal and cervical glands. Spleen : pulp filled with tubercles, majority of which had yellow caseous centres ; they projected from the capsular surface and formed little reddish prominences with yellow centre. Miliary granulation tubercles on peritoneal surface of left dome of diaphragm and in pouch of Douglas. Miliary granulation tubercles throughout liver. Brain : numerous caseous and granulomatous miliary and submiliary tubercles in Sylvian fissures ; a few miliary tubercles on mesial and under surfaces of parietal and occipital lobes ; gelatinous exudation in basal cisterns and over cord ; considerable hydrocephalus ; submiliary tubercles on cauda equina. Small abscess cavity in subcutaneous tissue of abdominal wall below umbilicus.

Bacteriological investigation.—Emulsions of the caseous mesenteric glands, spleen, and lungs were inoculated each into two guinea-pigs. Both guinea-pigs inoculated with spleen and one with lung emulsion died of an acute infection. What remained of these two emulsions (spleen and lung) was treated with 10 per cent. antiformin, centrifuged and inoculated each into one guinea-pig. Of the three guinea-pigs that remained from the first experiment two died in 26 and 28 days, the other and the two inoculated with antiformin-treated emulsions were killed 24 to 39 days after inoculation and showed severe general tuberculosis. The mesenteric gland and spleen emulsions were inoculated each into a rabbit as well as guinea-pigs. The one inoculated with spleen emulsion died of an acute infection. The mesenteric gland rabbit died of severe general tuberculosis in 68 days.

Microscopically the mesenteric gland emulsion showed very numerous tubercle bacilli, mostly short, but a few of medium length were beaded ; the spleen emulsion showed a moderate number of short tubercle bacilli.

Cultures were raised from the mesenteric glands, spleen, and lungs, in each case through the guinea-pig.

All the strains were dysgonic, exhibiting the cultural characters of bovine tubercle bacilli.

Each of the three strains proved highly virulent for the rabbit, producing rapidly fatal general progressive tuberculosis identical with that set up by standard bovine bacilli.

Summary.

A case of general miliary tuberculosis of alimentary origin in a female child aged 3 years.

Cultures isolated from the mesenteric glands, lung and spleen exhibited the cultural characters and virulence of a bovine tubercle bacillus.

CASE 52.

Male child.

Age.—4 years.

Cause of death.—Tuberculous meningitis.

Clinical notes.—Admitted to hospital on January 6, 1913, and died nine days late. He had been ill a fortnight with meningitis. There was a strong family history of tuberculosis.

Post-mortem notes.—The lungs contained moderately numerous caseating miliary tubercles (no primary focus of disease was found by the pathologist). Bronchial glands; on right side there was a completely caseous gland, the size of a filbert, beginning to soften; the intertracheo-bronchial glands contained caseous nodules up to a hempseed; in the glands on the left side there was an occasional caseous tubercle.

Mesenteric glands; nearly all showed one to three or four pinhead-sized cortical caseous tubercles; one gland the size of a hempseed was caseous practically throughout; the other glands were little if at all enlarged.

The spleen and liver showed a moderate number of evenly distributed submiliary grey tubercles. There were tubercles on the meninges.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands and a portion of the spleen. Emulsions of right bronchial gland, mesenteric gland (six tubercles) and the spleen were inoculated each into two guinea-pigs. Numerous slender and beaded tubercle bacilli were found in the bronchial gland emulsion, none in those of the mesenteric glands and spleen. The guinea-pigs were killed 34 and 35 days after inoculation and all showed slight general tuberculosis. Cultures were obtained from the bronchial glands and spleen direct and from the mesenteric glands through the guinea-pig. Each of the strains exhibited the cultural characters of the human tubercle bacillus. The bronchial gland and mesenteric gland strains produced only slight tuberculosis in the rabbit.

Summary.

A child, aged four years, who died of tuberculous meningitis showed at autopsy general miliary tuberculosis and enlarged caseous bronchial glands.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 53.

Male child.

Age.—4 years.

Cause of death.—Tuberculous cerebro-spinal meningitis.

Clinical notes.—Onset 3 weeks before admission (January 13, 1913) with vomiting and headache. Died on day of admission. Erysipelas at 7 weeks. Measles when 2 years old. Father and mother and 3 other children alive and well. One child died a week previously of "rapid consumption."

Post-mortem notes.—Lungs: miliary tubercles throughout, broncho-pneumonia, muco-purulent bronchitis with minute areas of collapse throughout both lungs. Right bronchial and inter-tracheo-bronchial glands much enlarged and composed throughout of dense creamy white caseating substance; early tuberculosis of glands on left side,

Intestines ; one caseous tubercle and three erosions in first part of ileum ; one tuberculous erosion in Peyer's patch, three feet from ileo-cæcal valve. Mesenteric glands : caseous gland (0·9 × 0·5 cm.) at upper end of mesentery and also one in lower part. Granulation tubercles on pleural surface of left dome of diaphragm ; numerous larger tubercles on peritoneal surface (both domes) ; sparsely scattered tubercles on parietal peritoneum.

Spleen : scattered grey and caseous tubercles.

Liver : scattered grey tubercles on the surface and on section.

Kidneys : a few caseous tubercles in the cortices.

Caseous right lower cervical glands.

Numerous miliary granulomatous tubercles on all the surfaces of the brain ; numerous tubercles on velum interpositum ; miliary sub-arachnoid tubercles on lumbar cord and cauda equina. Muco-pus in both middle ears.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands and a portion of the lung. Emulsion of the caseous bronchial and mesenteric glands were inoculated each into two guinea-pigs and an emulsion of lung into one. The guinea-pigs were killed 40 and 56 days after inoculation ; the lung guinea-pig had only slight tuberculosis, the others moderately severe tuberculosis. Scattered tubercle bacilli were found in a smear preparation of the bronchial gland emulsion, none in one from the mesenteric glands.

Cultures were obtained from the bronchial and mesenteric glands and the lung, in each case through the guinea-pig. The three strains grew luxuriantly on the differential media, like the human tubercle bacillus. The bronchial and mesenteric gland strains exhibited low virulence for the rabbit.

Summary.

A child aged 4 years who died of tuberculous cerebro-spinal meningitis showed at autopsy general miliary tuberculosis and caseous bronchial glands.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 54.

Female child.

Age.—1 year 2 months.

Cause of death.—Pulmonary tuberculosis.

Clinical notes.—None obtainable.

Post-mortem notes.—Lungs : There was excavation involving almost the whole of the small lobes of the right lung, with marked thickening of the pleura ; the right lower lobe was consolidated and beset with softened caseous tubercles ; the left lobes showed a few miliary tubercles scattered throughout. The bronchial glands were very much enlarged and caseous throughout. Mesenteric glands ; one in the upper part of the mesentery was the size of a pea, and was caseating throughout ; there was a caseous tubercle on the mesentery near it ; other mesenteric glands were normal. There was no obvious lesion of the intestine.

No notes were sent or were subsequently obtainable as to condition of other organs.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands and a portion of the lungs. Emulsions of a bronchial gland, the tuberculous mesenteric gland and the

lung were inoculated each into two guinea-pigs. There were numerous tubercle bacilli, many long curved and beaded, in the bronchial gland emulsion, and moderately numerous tubercle bacilli in the other two. The bronchial gland guinea-pigs died in 17 and 20 days of acute tuberculosis. The others were killed in 30 days after inoculation and showed general tuberculosis of moderate severity. A rabbit inoculated with bronchial gland emulsion showed after 92 days a local lesion, moderate tuberculosis of lungs, and very slight tuberculosis of kidneys. Cultures were obtained from a bronchial gland direct and through the guinea-pig, and from the mesenteric gland and the lung through the guinea-pig. The direct strain became contaminated and was not used. The others exhibited the cultural characters of the human tubercle bacillus.

The mesenteric gland and the lung strains were shown to possess low virulence for the rabbit.

Summary.

A case of pulmonary and bronchial gland tuberculosis in a child aged 1 year and 2 months with secondary tuberculosis of the mesenteric glands.

Cultures from the lung and a mesenteric gland exhibited the cultural characters and virulence of a human tubercle bacillus.

CASE 55.

Male child.

Age.—2 years 5 months.

Cause of death.—Tuberculous meningitis.

Clinical notes.—None obtainable.

Post-mortem notes.—There were scattered grey tubercles in the lungs. Bronchial glands : right bronchial moderately enlarged, extensively caseous, yellow and softened ; the intertracheo-bronchial on the right side were enlarged and partly caseous, on the left side they were enlarged indurated and showed caseous tubercles ; two slightly enlarged left bronchial glands were extensively caseous.

The intestines were said not to be ulcerated.

Mesenteric glands : two small glands were partly caseous, three others showed miliary caseous tubercles, the rest were normal. No tubercles were seen in the liver and spleen.

Bacteriological investigation.—Emulsions of the bronchial and mesenteric glands were inoculated each into two guinea-pigs. No tubercle bacilli found in bronchial gland emulsion. The guinea-pigs were killed 38 to 47 days after inoculation and all showed general tuberculosis, in no case severe.

Cultures were obtained from the bronchial gland through the guinea-pig and from the mesenteric glands direct as well as through the guinea-pig.

Each of the three strains grew luxuriantly on glycerin potato and produced pigmented layers on serum.

Both strains exhibited low virulence for the rabbit.

Summary.

A child, aged 2 years 5 months, who died of tuberculous meningitis showed at autopsy the most advanced lesions in the bronchial glands.

Cultures from the bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 58.

Female child.

Age.—11 years.

Cause of death.—General tuberculosis.

Clinical notes.—None obtainable.

Post-mortem notes.—Tuberculosis of all lobes of both lungs, with very extensive enlargement of the bronchial glands. The lung was very closely beset with large caseous coalescing nodules of irregular outline, in one place broken down to form a cavity; most of them were firm or only a little friable. The mass of bronchial glands measured 4 × 4 × 2·5 cm. and was composed throughout of creamy firm caseated substance. Intestines: there were discrete caseous tubercles in a few Peyer's patches but no ulceration. Mesenteric glands: in the mesentery of the ileum there was a group of four enlarged caseous glands ranging up to 1 cm.; in the rest of the mesenteric glands, which were not enlarged, eight caseous nodules were seen, affecting 4 glands. Retroperitoneal glands caseous. The spleen was closely beset with caseous nodules, ranging from a millet seed to a large pea; the larger ones were softening in the centre. There were scattered caseous tubercles in liver and kidneys.

Bacteriological investigation.—The tissues investigated were the bronchial and mesenteric glands and a piece of the spleen.

Guinea-pigs were inoculated with emulsions of mesenteric and bronchial glands and spleen, two with each emulsion. Smear preparations of these emulsions showed tubercle bacilli to be moderately numerous, mostly short or of medium length; a smear from the lung showed very numerous tubercle bacilli, finely beaded, and mostly of medium length and long. The guinea-pigs were killed 36 days after inoculation and showed general tuberculosis, in no case severe. A rabbit inoculated subcutaneously with bronchial gland emulsion showed, after 70 days, a local lesion, scattered nodules and tubercles in the lungs, and one tubercle in a kidney. Cultures were raised direct from the lung, bronchial and mesenteric glands and spleen. All the strains grew luxuriantly, and the three former exhibited for the rabbit the virulence of the human tubercle bacillus.

Summary.

A case of severe general tuberculosis in a child aged 11 years; the bronchial gland group was the most extensively caseated group of glands.

Cultures from the lung and bronchial and mesenteric glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 59.

Female child.

Age.—2 years.

Cause of death.—Broncho-pneumonia.

Clinical notes.—Admitted with dyspnœa and cyanosis. There were moist râles all over the chest and a patch of broncho-pneumonia at the right base. Two brothers died of bronchitis and one sister has "fibroid" lung.

Post-mortem notes.—Left lung: apex and anterior border of upper lobe collapsed, rest of upper lobe solid; on section many pale areas seen slightly suggestive of tubercles; other lobe somewhat collapsed.

Right lung ; upper lobe œdematous, containing nodules of consolidation ; lower collapsed and broncho-pneumonic.

Bronchial glands much enlarged, firm, and congested ; no foci of tuberculosis seen. Mesenteric glands were normal in size ; in several of them, however. whitish foci up to a pin head in size, very like tubercles, were seen. Two of the ileo-colic glands showed a few opaque yellowish foci which, when crushed between plates, were found to be dry and gritty. (No tubercle bacilli.)

Bacteriological Investigation.—The tissues investigated were the bronchial and mesenteric glands and portions of the lung. An emulsion of bronchial glands was inoculated into four guinea-pigs and an emulsion of 12 mesenteric glands into three guinea-pigs. The mesenteric gland emulsion showed scattered tubercle bacilli, mostly long, curved and beaded. The guinea-pigs died or were killed 30 to 48 days after inoculation and all showed general tuberculosis, in most of them moderately severe. Cultures were isolated from the mesenteric and bronchial glands, in each case through the guinea-pig.

Both strains grew luxuriantly on the differential media and proved of low virulence for the rabbit.

Summary.

A child aged 2 years, who died of broncho-pneumonia, showed at autopsy scattered tubercles in the mesenteric glands and no sign of tuberculosis elsewhere. The not apparently tuberculous bronchial glands, however, produced tuberculosis in guinea-pigs.

Cultures derived from the mesenteric and bronchial glands exhibited the cultural characters and virulence of the human tubercle bacillus.

CASE 60.

Male child.

Age.—3 years.

Cause of death.—Scalds.

Clinical history.—The child was scalded and died next day. He was breast-fed for 14 months. There was no history of consumption in the family.

Post-mortem notes.—Scalds of first, second, and third degrees down left side. Moderately enlarged pharyngeal, faucial and lingual tonsils. Large cervical glands, especially on right side. Congestion of lungs, liver, and kidneys ; no tuberculosis. Small tuberculous ulcer (6 × 3 mm.) with slightly shelving edges and a few miliary nodules in base in a Peyer's patch 5 ft. 7 in. from ileo-cœcal valve. Peritoneal surface free. All the Peyer's patches were well-developed.

Mesenteric glands : In the part of the mesentery corresponding to the intestinal ulcer were two enlarged glands one on each side of the mesentery ; one was 3 × 1·8 cm. the other was somewhat smaller ; they showed on section soft yellow foci and around the periphery of the glands about 1 mm. beneath the capsule patches of softened purulent material which separated at these spots the peripheral from the central parts of the gland. The rest of the mesenteric glands appeared normal. Marked congestion of brain and meninges. Middle ears dry.

Bronchial glands appeared congested and were a little enlarged.

Bacteriological investigation.—An emulsion of tuberculous mesenteric glands was inoculated into two guinea-pigs, and both died of

acute tuberculosis. Some of the emulsion was also inoculated subcutaneously into a rabbit which died of severe general tuberculosis in 83 days.

Microscopically the emulsion showed numerous tubercle bacilli, mostly short.

An emulsion of eight normal-looking mesenteric glands failed to produce tuberculosis in two guinea-pigs.

An emulsion of the bronchial glands was inoculated into three guinea-pigs: one died of an acute infection; the others killed 30 days after inoculation showed slight general tuberculosis.

A culture was obtained direct from a tuberculous mesenteric gland, but it was lost owing to a contamination.

Cultures were obtained from the mesenteric and the bronchial glands through the guinea-pig.

Both strains were very dysgonic, exhibiting the cultural characters of a bovine tubercle bacillus. Each strain produced in the rabbit severe progressive general tuberculosis identical with that set up by bovine tubercle bacilli.

Summary.

A male child aged 3 years, who died of scalds, showed post-mortem a tuberculous intestinal ulcer and caseous mesenteric glands, and no sign of tuberculosis elsewhere.

Cultures were obtained from the mesenteric glands and the bronchial glands, and these exhibited the cultural characters and virulence for the rabbit of a bovine tubercle bacillus.

CASE 62.

Male child.

Age.—1 year 7 months.

Cause of death.—Tuberculous meningitis.

Clinical notes.—Admitted with meningitis and died third day after admission. Abscess in left ear two months ago. No other illnesses. Bottle fed since birth. Father alive and well, mother has heart trouble, no tubercle in the family. Three other children alive and well, two others died of pneumonia.

Post-mortem notes.—Intestines: A few submucous tubercles in Peyer's patches and solitary follicles of ileum with erosion of their surfaces and tubercles on their peritoneal surfaces; small tuberculous ulcer 14½ feet from ileo-cæcal valve; a few pinhead erosions in large intestine; miliary granulation tubercles on mesentery. Mesenteric glands: At upper end of mesentery and around head of pancreas there were seven or eight enlarged glands, up to a kidney bean in size, which on section were composed practically throughout of firm opaque whitish caseated substance; other mesenteric glands showed here and there a caseous tubercle; pyloric glands caseous. A few miliary tubercles in cervical glands. A considerable number of miliary granulation tubercles on visceral and parietal pleuræ and throughout both lungs. Bronchial slightly enlarged showed in the cortices scattered miliary caseous tubercles. Miliary granulation and a few small caseous tubercles throughout spleen. Scattered miliary tubercles in liver and kidneys. Caseous lumbar gland. Axillary glands free. Brain: Closely set miliary and submiliary tubercles on outer surfaces of brain above and below Sylvian fissures and on lower and mesial surfaces of frontal lobes and in Sylvian fissures; a few scattered tubercles over rest of brain.

Considerable number of submiliary tubercles on cord and cauda equina.

Bacteriological investigation.—The tissues investigated were the mesenteric and bronchial glands. An emulsion of caseous mesenteric glands was inoculated into three guinea-pigs intraperitoneally and one rabbit subcutaneously. A smear preparation of the emulsion showed numerous tubercle bacilli, mainly short; several of medium length showed beading. One of the guinea-pigs was killed 24 days after inoculation, the other two died in 40 and 47 days. All showed general tuberculosis of moderate severity; the rabbit killed after 52 days showed moderately severe general tuberculosis (bovine). An emulsion of bronchial glands was inoculated into two guinea-pigs. A smear preparation showed one short tubercle bacillus. Both guinea-pigs became tuberculous.

Cultures were obtained from the mesenteric glands direct and through the guinea-pig and from the bronchial glands through the guinea-pig. The three strains displayed identical cultural characters, growing like bovine tubercle bacilli.

The mesenteric and bronchial gland strains were tested on the rabbit and produced rapidly fatal tuberculosis indistinguishable from that set up by bacilli of bovine tuberculosis.

Summary.

A case of general miliary tuberculosis in a child, aged 1 year 7 months, with primary intestinal and mesenteric gland tuberculosis.

Cultures from the mesenteric and bronchial glands exhibited the cultural characters and virulence of a bovine tubercle bacillus.

Case 66.

Male child.

Age.—5 years.

Cause of death.—Lymphadenoma and miliary tuberculosis of lungs.

Clinical notes.—Had had measles and chicken-pox. Two years before admission a gland from the neck was removed and this showed early tuberculosis.

Post-mortem notes.—Lungs: the right lung contained numerous evenly distributed submiliary grey tubercles; the left lung also contained miliary tubercles, and in the posterior part of the upper lobe there was a yellowish white nodule surrounded by thick pigmented fibrous tissue.

Bronchial glands: the intertracheo-bronchial and bronchial glands from one side were submitted to me for bacteriological examination: these were a little large and congested but showed no obvious tuberculosis; the bronchial glands on the other side were said to be caseating.

Mediastinal glands: four much enlarged glands attached to the aorta were examined by me; these were lymphadenomatous glands and showed in the cortices near the periphery a good many irregular opaque white caseous patches. Pancreatic, lumbar, submaxillary, cervical and axillary glands were similarly affected.

Mesenteric glands: these were normal in size; two glands each contained two caseous tubercles, ranging from a pinhead to a millet seed.

Larynx: erosion of mucous membrane over and around both vocal chords. Nothing stated as to condition of other organs.

Bacteriological investigation.—Emulsions of the bronchial, mediastinal and mesenteric glands were inoculated each into two guinea-pigs. A few long beaded tubercle bacilli were found in the bronchial gland emulsion, numerous tubercle bacilli, mostly long, curved, beaded, or vacuolated in the mesenteric gland, and extremely numerous tubercle bacilli in the mediastinal gland emulsion.

The guinea-pigs died or were killed after 20 to 36 days and all showed general tuberculosis.

Cultures were isolated direct from a mediastinal gland and through the guinea-pig from the bronchial and mesenteric glands.

The three strains grew luxuriantly and two of them (mediastinal and mesenteric gland strains) exhibited low virulence for the rabbit.

Summary.

A child, aged 5 years, who died of lymphadenoma and miliary tuberculosis of the lungs, showed at autopsy a primary nodule in the lungs, caseation of the bronchial glands, tubercles in the mesenteric glands and tuberculosis of most of the lymphadenomatous glands.

Cultures derived from a mediastinal gland and the mesenteric glands exhibited the cultural characters and virulence of a human tubercle bacillus.

CASE 67.

Male child.

Age.—1 year 9 months.

Cause of death.—Tuberculous meningitis.

Clinical notes.—The child was a full time and an only child, and was breast fed. After weaning he was fed upon bread and milk. No infectious illnesses. Large glands of the neck were noticed in November, 1912. He was admitted to hospital with respiratory obstruction on January 30, 1913, and tracheotomy was performed; a culture from the larynx showed streptococci. The child died on March 2nd, 1913. Father and mother alive and well.

Post-mortem notes.—Extensive ragged tuberculous ulceration of posterior pharyngeal wall and of both tonsils. The ulceration had spread to the aryteno-epiglottidean folds, to soft palate and to epiglottis, which was infiltrated. The tonsillar tissue was caseated, and there were large caseous areas in enlarged cervical glands. The retropharyngeal glands were enlarged and showed caseous foci. There were numerous tuberculous ulcers, a few of them annular, throughout the small intestines. There were numerous tubercles on the serous surfaces of the ulcers, and slight peritoneal adhesion over ulcers. Caseous follicles with a few small ulcers in cæcum. The mesenteric glands were enlarged and contained caseous areas; only a portion of the mesentery was examined by me; this contained one bean-sized and one pea-sized gland composed of creamy white friable caseated substance; a few others contained caseous foci. Lungs contained granulomatous miliary tubercles throughout. Spleen, liver, and kidneys showed submiliary tubercles throughout; the kidneys in addition showed œdema and parenchymatous degeneration. Brain: there was gelatinous thickening of meninges in basal cisterns and along fissures, subarachnoid tubercles in neighbourhood of fissures, especially on superior surface of cerebellum, and gross internal hydrocephalus. No naked eye tubercles on spinal cord. Muco-pus in left middle ear. The child was extremely wasted, with sunken orbits.

Bacteriological investigation.—The material investigated was the structures of the pharynx, intestines and mesenteric glands. No other tissues were obtainable.

Emulsions of mesenteric and pharyngeal glands were made, and small quantities of each inoculated into two guinea-pigs. Smear preparations of both emulsions showed very numerous tubercle bacilli. Smears of scrapings from a tonsil and an intestinal ulcer resembled preparations from pure cultures of tubercle bacilli. The bacilli were mostly short and well-stained ; there were others of medium length which were beaded and vacuolated.

The mesenteric gland guinea-pigs died in 22 and 27 days ; one of the guinea-pigs inoculated with pharyngeal gland was killed after 32 days, the other died in 40 days ; all four guinea-pigs showed severe general tuberculosis.

Cultures were obtained direct from the pharyngeal and mesenteric glands, in the former case with the aid of antiformin. Cultures were also obtained from each of the four guinea-pigs.

All the strains exhibited the cultural characters of a bovine tubercle bacillus.

One rabbit inoculated intravenously with a small dose of the mesenteric gland emulsion died in 25 days of acute general miliary tuberculosis. Another inoculated with pharygeal gland emulsion died in four days of slight pseudo-tuberculosis.

The two direct cultures (pharyngeal gland and mesenteric gland) were tested on rabbits and produced the severe and rapidly fatal general tuberculosis characteristic of standard bovine viruses.

Summary.

A case of general miliary tuberculosis primary in the alimentary tract in a male child, aged 1 year 9 months.

Cultures obtained direct from a pharyngeal and a mesenteric gland exhibited the cultural characters and the high virulence of a bovine tubercle bacillus.

CASE 68.

Female child.

Age.—4 years.

Cause of death.—Tuberculous meningitis.

Clinical notes.—Measles when two weeks old. Swollen neck and sore throat December 1912. Onset with vomiting one week before admission in February 1913. Died March 8th, 1913. Father and mother strong ; two other children alive and well, one other died of meningitis.

Post-mortem notes.—Considerably wasted child. Lungs : caseous areas 1–7 cm. in diameter in left upper lobe near posterior border ; purulent bronchitis with areas of peribronchial infiltration in left lower lobe ; fibrous peribronchial strands extending from caseous area to glands in hilum ; delicate fibrous adhesions with a few miliary tubercles on parietal pleura over angle of fourth left rib. Bronchial glands : On the left side the interbronchial glands were enlarged, caseous, and softened ; a left bronchial gland, the most posterior in position, was the size of a French bean and was caseous and softened throughout ; another more anterior showed early caseation ; there was a caseous tubercle or two in the intertracheobronchial glands but the glands on the right side appeared normal ; submiliary caseous tubercles in left tracheal glands. Two submiliary tubercles in spleen. No tubercles visible in congested liver

and kidneys. Muco-pus in left middle ear and mastoid. Brain: Numerous tubercles in matted Sylvian fissures; patch of submiliary tubercles surrounded by marked congestion and ecchymosis in centre of right hemisphere; a few submiliary tubercles in left hemisphere. Mesenteric glands not available and not mentioned in post-mortem notes.

Bacteriological investigation.—An emulsion of left bronchial glands was inoculated into two guinea-pigs. One tubercle bacillus was found in the emulsion after prolonged search. One of the guinea-pigs was killed after 21 days, the other died in 68 days. Both showed general tuberculosis, in the latter animal chronic and without much caseo-necrosis.

A culture isolated from the first guinea-pig grew luxuriantly on the differential media and exhibited low virulence for the rabbit.

Summary.

A case of tuberculous meningitis in a child, aged 4 years, who showed at autopsy a primary caseous area in the lung and secondary bronchial gland tuberculosis.

A culture derived from the bronchial glands exhibited the cultural characters of a human tubercle bacillus.

CASE 69.

Male child.

Age.—5 years.

Cause of death.—Diphtheria.

Post-mortem notes.—Mesenteric glands: normal in size except one, which was nearly the size of a thrush's egg; this gland was a thin-walled cyst filled with thick creamy caseo-pus. Bronchial glands: enlarged, congested; no sign of tuberculosis. There was no sign of tuberculosis in the body except in the mesenteric glands.

Bacteriological investigation.—Practically the whole of the pus from the mesenteric gland was inoculated into three guinea-pigs. A smear preparation showed scattered tubercle bacilli and amorphous débris; the bacilli were of short and medium lengths, the longer ones being vacuolated. An emulsion of the bronchial glands was inoculated into three guinea-pigs. One out of each set of guinea-pigs was killed 39 days, the others 64 days, after inoculation. Not one showed any sign of tuberculosis. Cultures from the pus remained sterile.

Summary.

A child, aged 5 years, who died of diphtheria, showed caseous and softened mesenteric glands and no sign of tuberculosis elsewhere.

Guinea-pigs inoculated with the caseo-pus and emulsion of the bronchial glands did not develop tuberculosis.

CASE 70.

Male child.

Age.—2 years.

Cause of death.—Measles and broncho-pneumonia.

Clinical notes.—Admitted with measles and died of broncho-pneumonia.

Post-mortem notes.—Mesenteric glands: in the middle portion of the mesentery there was a group of three enlarged glands, 3 cm. in length; each contained caseo-purulent areas replacing from a third to two-thirds of the gland substance; another gland close to this group, but nearer the root of the mesentery, contained a caseous

tubercle or two; other glands were normal. Bronchial glands: one intertracheo-bronchial gland on right side was the size of a pigeon's egg and showed about half its substance caseous and softened; one of the right prætracheo-bronchial glands was the size of a sparrow's egg and was partly caseous and softened; another near the latter was enlarged, congested, and contained a caseous tubercle or two; other bronchial glands were enlarged and congested but not definitely tuberculous. The lung was broncho-pneumonic but not tuberculous.

Bacteriological investigation.—Emulsions of the tuberculous mesenteric glands and the right prætracheo-bronchial gland were inoculated each into three guinea-pigs. One guinea-pig was killed in 22 days, but the others died in 46 to 56 days; all showed general tuberculosis, which was of great severity in the majority of instances.

No tubercle bacilli were found in the mesenteric gland emulsion but there were moderately numerous tubercle bacilli, mostly short and well-stained, in the bronchial gland emulsion.

Cultures were obained from the mesenteric glands direct and from the bronchial glands (direct cultures having become contaminated) through the guinea-pig.

Both strains were very dysgonic, exhibiting the cultural characters of a bovine tubercle bacillus. They also produced in the rabbit general tuberculosis indistinguishable from that set up by bovine tubercle bacilli.

Summary.

A child, aged 2 years, who died of measles and broncho-pneumonia showed at autopsy caseous mesenteric and bronchial glands.

Cultures derived from these glands exhibited the cultural characters and virulence of a bovine tubercle bacillus.

CASE 71.

Female child.

Age.—3 years.

Cause of death.—Tuberculous meningitis and disseminated tuberculosis.

Clinical notes.—Had a fit when two years old, and measles and pneumonia a month or two previously. Fell on head 14 days before admission, and was admitted sleepy and with a squint. Father and mother alive and well. Three other children alive and well. No consumption known on either side of family.

Post-mortem notes.—Lungs: emphysematous with a few miliary granulation tubercles; small caseous gland in peribronchial tissue of main bronchus to left lower lobe 1·5 cm. from hilum; miliary granulation tubercles extending therefrom to form a wedged-shaped area in anterior extremity of the left lower lobe; caseous wedge-shaped area in centre of this wedge. A few granulation tubercles on visceral pleura of both sides and a few scattered tubercles on parietal pleura at angles of ribs. Bronchial glands: a left inter-bronchial and the left bronchial glands were enlarged (2·2 × 1·2 cm.) and caseous throughout; the right bronchial glands were enlarged and beset with miliary caseating tubercles. No ulceration of intestine. Mesenteric glands normal in size; here and there a submiliary caseous tubercle; submiliary tubercle in a gland attached to cæcum. Numerous miliary granulation tubercles in spleen, a few beneath capsule of right lobe of liver. Brain: gelatinous exudation in basal cisterns; matting and submiliary tubercles in Sylvian

fissures; scattered miliary tubercles on surfaces of frontal and parietal lobes; considerable internal hydrocephalus; scanty cloudy subarachnoid fluid in cord; a few miliary tubercles on cauda equina.

Bacteriological investigation.—Tissues investigated were bronchial glands and lung.

Emulsions of lung nodule and bronchial glands were inoculated each into two guinea-pigs. Microscopical examination showed scattered long and vacuolated tubercle bacilli in lung emulsion, and two tubercle bacilli in bronchial gland emulsion. All the guinea-pigs developed general tuberculosis.

A culture was obtained direct from a tuberculous bronchial gland of the child. The culture grew luxuriantly on the differential media and exhibited low virulence for the rabbit.

Summary.

A case of tuberculous meningitis and disseminated tuberculosis, primary in the thorax, in a child aged three years.

A culture obtained from a bronchial gland exhibited the cultural characters and virulence of a human tubercle bacillus.

CASE 73.

Female child.

Age.—9 years.

Cause of death.—Pulmonary tuberculosis.

Clinical notes.—Bronchitis and whooping-cough five years ago. Family history of consumption, mother's brother having died of phthisis.

Post-mortem notes.—Lungs: cavity size of tangerine in left upper lobe; wall very vascular and covered with adherent caseous material, also several smaller cavities; upper lobe of right contained one or two small cavities, largest size of filbert, and also small masses of conglomerate tubercles; middle lobe showed a few tubercles. Left pleura adherent to chest wall and pericardium. Superficial tuberculous ulceration of mucous membrane of trachea. Bronchial glands: on left side two were partly caseo-calcareous, the tuberculous tissue being firm and dry; other glands were enlarged, firm but not obviously tuberculous. Intestines: peritoneal surfaces of small intestines studded throughout with small tubercles; in cæcal region between coils of small intestine and abdominal wall small collection of tuberculous pus; ulcers throughout whole length of ileum, most numerous in terminal part. Mesenteric glands: majority contained caseous foci in cortices. Peritoneal surface of bladder studded with tubercles.

Bacteriological investigation.—One guinea-pig was inoculated with an emulsion of a caseous patch from the lung. A smear preparation of the emulsion showed moderately numerous tubercle bacilli, slender and beaded and many in clumps. The guinea-pig was killed 33 days after inoculation and showed general tuberculosis. A culture isolated from this guinea-pig grew luxuriantly on the differential media and proved of low virulence for the rabbit.

Summary.

A case of pulmonary tuberculosis with secondary intestinal and mesenteric gland tuberculosis in a child aged 9. A culture from the lung exhibited the cultural character and virulence of the human tubercle bacillus.

Tabular Summaries of Experiments on Rabbits with Cultures.

Rabbits inoculated with eugonic cultures.

Number of case.	Origin of culture.	Whether direct or through G.P.	Details of culture.			Dose.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
			Age of sub-culture.	Generation.	Total period of cultivation.				Initial.	Final.		
			Days.		Days.	Mg.					Days.	
1	Mesenteric glands.	G.P.	13	4th	40	10	Subcut.	295	1680	2200	K. 122	Local lesion, a hen's egg sized caseo-purulent cyst. Scapular glands enlarged, contained caseous and softened nodules. Lungs—Moderately numerous caseating nodules, 8 to 10 mm., on surface and in depth; solid caseating patches in thin margins.
	,,	,,	13	4th	40	10	,,	296	2040	3120	K. 122	Very large cystic lesion; nearest glands normal. Lungs—A few superficial and marginal caseating patches.
	Bronchial glands.	,,	13	4th	40	10	,,	297	1740	2400	K. 122	Moderately large cystic lesion; one scapular gland partly caseous and softened. Lungs—Scattered caseating tubercles and three small marginal caseating patches.
	,,	,,	13	4th	40	10	,,	298	2000	1820	D. 4	Volvulus of cæcum.
2	Mesenteric glands.	,,	10	4th	38	10	,,	291	2030	3000	K. 117	Small caseous lesion; nearest glands normal. Lungs—Two small superficial caseating patches.
	,,	,,	10	4th	38	10	,,	292	1960	3090	K. 117	Large cystic lesion; nearest glands normal. Lungs—Two marginal grey nodules (2 mm.) and a small patch of conglomerate tubercles,
5	Cervical	,,	9	3rd	44	10	,,	329	2350	1510	D. 57	Caseous local lesion; a scapular gland contained caseous tubercles. Lungs—About 12 caseating nodules up to split hempseed.
	,,	,,	9	3rd	44	20	,,	330	1720	1220	D. 60	Caseous local lesion; scapular glands contained small caseous nodules. Lungs—Moderate number of miliary and submiliary tubercles.

Tabular Summaries of Experiments on Rabbits with Cultures—*continued*.

Rabbits inoculated with eugonic cultures—continued.

Number of case.	Origin of culture.	Whether direct or through G.P.	Details of culture.			Dose.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
			Age of sub-culture.	Generation.	Total period of cultivation.				Initial.	Final.		
			Days.		Days.	Mg.					Days.	
7	Bronchial gland.	G.P.	4	4th	38	10	Subcut.	331	2140	1510	D. 94	Moderately large soft caseous lesion; in nearest glands caseous tubercles and nodules. Lungs—Many superficial caseating areas on surface, up to 8 mm., confluent on dorsal surfaces of posterior lobes; only few nodules internally. (Eugonic culture isolated.) Kidneys—One cortical tubercle.
	,,	,,	4	4th	38	10	,,	332	2100	3010	K. 99	Softened caseous local lesion; nearest glands normal. Lungs—Scattered grey tubercles and patches, some with caseous foci.
	Mesenteric gland.	,,	21	3rd	44	33	,,	352	1960	2300	D. 96	Softened caseous lesion; in each sacpular gland a caseous tubercle. Lungs—Sparsely scattered submiliary caseous tubercles, two or three small softened caseous nodules and a marginal caseating patch.
	Spleen	,,	17	4th	44	34	,,	353	1930	1620	D. 7 6	Cystic caseous lesion; scapular glands filled with caseous and softened nodules. Lungs—Scattered caseous tubercles. Death from pseudo-tuberculosis.
8	Mesenteric gland.	Direct	10	5th	90	10	,,	335	2000	2430	K. 93	Cystic caseous lesion, hen's egg sized; nearest glands normal. Lungs—Scattered rather superficial irregular nodules up to 7 or 8 mm., grey and infiltrated with caseous foci; most numerous dorsally.

	„	„	10	5th	90	10	„	336	2100	1470	D. 91	Moderately large cystic caseous lesion ; one scapular and one tracheal gland contained caseous foci. Lungs—Enlarged ; moderately numerous caseous nodules up to 1 cm. on dorsal surfaces, few similar ones ventrally, hardly any internally. (Pure culture of human tubercle bacillus isolated.) Kidneys—A few cortical caseous foci in each. Portal gland, one caseous focus.
	Bronchial gland.	„	10	5th	90	10	„	337	2150	2000	K. 94	Cystic caseous lesion ; nearest glands normal Lungs—Moderate number of grey caseating nodules up to 5 mm. ; a few on ventral surfaces and scattered tubercles in the depth. Kidneys—One pin-head caseous tubercle.
	„	„	10	5th	90	30	„	338	1950	1290	D. 35	Small caseous lesion and a few grey tubercles in lungs.
	Spleen	„	10	5th	90	10	„	339	1920	1900	K. 94	Cystic caseous lesion size of hen's egg ; nearest glands normal. Lungs—Each contained about a dozen caseating nodules.
11	Bronchial glands.	G.P	13	4th	59	10	„	387	1730	1660	K. 133	Cystic caseous lesion ; in one scapular gland, a caseous tubercle. Lungs—Rather more than half surfaces occupied by solid caseating patches of variable but mostly of considerable thickness ; centres of lobes crepitant with only few tuberculous patches.
	„	„	13	4th	59	10	„	388	1710	2360	K. 133	Cystic caseous lesion ; nearest glands normal. Lungs—One marginal caseating patch, 2 mm.
14	Bronchial glands.	Direct	17	5th	81	15	„	366	2240	2540	K. 122	Moderately large cystic caseous lesion ; nearest glands normal. Lungs—Moderately closely beset with caseating miliary tubercles, most numerous dorsally. Kidneys—Moderate number of submiliary grey tubercles.
	Mesenteric glands.	G.P.	16	3rd	68	25	„	408	1840	1800	K. 129	Cystic caseous lesion ; nearest glands normal. Lungs—Scattered caseating tubercles ; most on dorsal surfaces. Kidneys—Fairly numerous surface pits, but no tubercles.
	„	„	16	3rd	68	25	„	409	2070	1350	D. 85	Ulcerated and secondarily infected local lesion ; nearest glands not tuberculous. Lungs—About two dozen caseous tubercles up to 2.5 mm. Kidneys—Surface pits but no tubercles.
19	Bronchial glands.	„	19	4th	63	25	„	429	4040	3900	K. 132	Large cystic caseous lesion ; nearest glands normal. Lungs—Extensively consolidated with grey caseating tuberculous tissue ; only the central parts of the lungs and a few islands on their surfaces were crepitant ; anterior lobes solid practically throughout. Kidneys—In one a grey tubercle and a caseous streak.

Tabular Summaries of Experiments on Rabbits with Cultures—*continued.*

Rabbits inoculated with eugonic cultures—continued.

Number of case.	Origin of culture.	Whether direct or through G.P.	Details of culture.			Dose.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
			Age of sub-culture.	Generation.	Total period of cultivation.				Initial.	Final.		
			Days.		Days.	Mg.					Days.	
19 *cont.*	Mesenteric glands.	G.P.	19	3rd	44	50	Subcut.	406	1650	1650	K 127	Large local cyst filled with caseo-pus. One scapular gland contained a caseous nodule (2 mm.). Lungs—Scattered, flattened, superficial caseating nodules up to 5 mm. and scattered tubercles up to a millet-seed. Kidneys—Surface pits and sparsely scattered submiliary grey-white tubercles.
21	Bronchial glands.	,,	19	3rd	43	10	,,	404	1500	1800	K. 127	Cystic caseous lesion size of hen's egg ; nearest glands normal. Lungs—Sparsely scattered tubercles up to millet-seed. Kidneys—Numerous small pits ; no definite tubercles.
	,,	,,	19	3rd	43	10	,,	405	1690	2100	K. 127	Cystic caseous lesion ; nearest glands normal. Lungs—Numerous caseating nodules chiefly on dorsal surfaces, where they were confluent; fewer on ventral surfaces, and very few in depth. Kidneys—Numerous surface pits, no tubercles.
34	Mesenteric glands.	,,	20	3rd	57	10	,,	434	2040	1590	D. 20	Local lesion only. (?) cause of death.
	,,	,,	12	6th	150	10	,,	564	2080	2670	K. 91	Cystic caseous lesion size of small hen's egg ; nearest glands normal. Lungs—One caseous tubercle.
	Bronchial glands.	,,	20	3rd	57	10	,,	435	1870	2250	K. 128	Cystic caseous lesion. In each scapular gland a caseo-purulent focus. Lungs—About a dozen caseating nodules up to a split hempseed. Kidneys—Two small cortical tubercles and a hempseed sized nodule.

39	„	„	14	4th	47	16	„	474	1800	1100	D. 34	Caseous local lesion ; caseous nodules in scapular glands. Lungs—One tubercle. Death from broken canine tooth.
	„	„	12	6th	113	10	„	565	1950	2690	K. 91	Flat cystic caseous lesion ; nearest glands normal. Lungs—10 to 12 caseating nodules up to split pea and one marginal caseating patch.
40	Mesenteric glands.	„	16	3rd	62	20	„	472	1840	2360	K. 113	Caseous abscess size of Tangarine orange ; scapular glands cystic and filled with watery fluid. Lungs—Two submiliary grey tubercles.
	Bronchial glands.	Direct	16	5th	97	20	„	473	1510	2120	K. 113	Caseous local lesion of moderate size ; nearest glands normal. Lungs—Sparsely scattered miliary and submiliary tubercles and two small superficial caseating patches. Kidneys—Cortical submiliary grey tubercle in one, medullary caseous hempseed sized nodules in other.
43	Mesenteric glands.	„	15	5th	64	20	„	438	1860	2400	K. 136	Caseous cystic local lesion size of hen's egg ; in one scapular gland a millet-seed sized caseo-purulent tubercle. Lungs—Margins solid and caseating and elsewhere superficial caseating patches, a few isolated nodules in depth. Kidneys—Surfaces extensively pitted and scarred, no tubercles anywhere.
	Bronchial glands.	„	15	5th	64	20	„	439	2350	2170	K. 136	Small cystic caseous lesion ; nearest glands normal. Lungs—About three dozen marginal and superficial caseating patches, 2 to 10 mm. in diameter ; a few small nodules in depth. Kidneys—Scattered minute greyish-white cortical tubercles.
44	Mesenteric glands.	G.P.	12	3rd	53	10	„	493	1360	1560	K. 107	Caseous and softened lesion ; one scapular gland pea-sized and filled with muco-pus. Lungs—Moderate number of caseous and softened nodules up to a pea in size.
	Bronchial glands.	„	12	3rd	53	17	„	494	1270	1910	K. 107	Small caseous softened lesion ; nearest glands normal. Lungs—Moderately numerous submiliary tubercles with caseous centres, more on surface than in depth. Kidneys—Minute opaque focus in cortex of one.
	Spleen ...	„	12	3rd	53	12	„	495	1220	1660	K. 107	Small caseous softened lesion ; one scapular gland showed small cavity filled with turbid fluid. Lungs—Four miliary tubercles and a patch of conglomerate tubercles.
45	Mesenteric glands.	Direct	20	3rd	52	25	„	423	1850	2130	K. 130	Large cystic lesion filled with caseo-pus ; nearest glands normal. Lungs—Six grey nodules, with opaque centres, up to hempseed in size. Kidneys—Numerous pits and a grey focus or two.

TABULAR SUMMARIES OF EXPERIMENTS ON RABBITS WITH CULTURES—*continued.*

Rabbits inoculated with eugonic cultures—continued.

Number of case.	Origin of culture.	Whether direct or through G.P.	Details of culture.			Dose.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
			Age of sub-culture.	Generation.	Total period of cultivation.				Initial.	Final.		
			Days.		Days.	Mg.					Days.	
45 *cont.*	Bronchial glands.	G.P.	16	7th	184	0·01	Intrav.	628	1880	2150	K. 99	Scattered tubercles in anterior parts of lungs; thin walled caseo-purulent nodules in posterior; one caseous wedge-shaped nodule in a kidney.
	,,	,,	,,	,,	,,	0·1	,,	629	1680	2070	K. 95	Scattered caseating tubercles and one marginal caseating patch in lungs; one submiliary tubercle in each kidney.
	,,	,,	,,	,,	,,	10·0	Subcut.	630	1980	2920	K. 99	Caseous and softened cystic lesion; nearest glands normal; moderate number of grey nodules with scanty caseation in lungs.
46	,,	,,	8	3rd	46	10	,,	490	1320	2010	K. 111	Caseous and softened lesion; nearest glands normal. Lungs—Scattered tubercles up to millet seed.
	,,	,,	8	3rd	46	10	,,	491	1360	1930	K. 111	Caseous and softened lesion, hen's egg sized; one scapular gland cystic and contained watery fluid and a caseous focus or two. Lungs—One caseous tubercle.
47	,,	Direct	20	4th	51	25	,,	424	1440	870	D. 64	Small caseous lesion; nearest glands normal; one tracheal gland contained caseous-foci. Lungs—Moderate number of caseating nodules up to a pea in size. Liver—Slight psorospermosis.
	Mesenteric glands.	G.P.	17	3rd	39	10	,,	441	1490	1620	K. 126	Caseo-purulent local abscess; nearest glands normal. Lungs—Discrete tubercles caseous centrally and some superficial patches of conglomerate tubercles. Kidneys—Two minute grey-white tubercles and one grey nodule (2 mm.) in cortices; caseo-pus in a calyx of one.

49	„	„	10	3rd	40	14	„	488	1430	1830	K. 111	Caseous softened lesion moderately large ; nearest glands normal. Lungs—Sparsely scattered tubercles, 2 or 3 groups of conglomorate tubercles and a caseous nodule (split pea).
	Bronchial glands.	„	10	3rd	38	13	„	489	1350	1760	K. 111	Spontaneous tuberculosis.
	„	„	7	6th	169	10	„	635	1780	2580	K. 91	Small softened lesion ; one scapular gland cystic and filled with caseo-pus. Lungs—Scattered grey tubercles and a few marginal, slightly caseous patches. Spleen—One pinhead sized caseous tubercle.
52	Mesenteric glands.	„	6	3rd	42	10	„	501	1230	2010	K. 106	Small softened caseous lesion : nearest glands normal. Lungs—Scattered tubercles up to a millet-seed.
	Bronchial glands.	Direct	6	3rd	76	8·5	„	502	1280	1590	K. 106	Small softened caseous lesion ; nearest glands normal. Lungs—Two caseous tubercles.
53	Mesenteric glands.	G.P.	19	4th	51	12	„	509	2010	2400	K. 89	Caseous softened lesion size of a hen's egg; nearest glands normal. Lungs—About six grey nodules up to 6 mm. containing caseous foci. Kidneys—One showed a cortical fibrous streak.
	Bronchial glands.	„	19	4th	51	11	„	510	1950	2180	K. 89	Caseous and softened lesion size of hen's egg ; nearest glands normal. Lungs—Three caseous split-pea nodules and about ½ dozen grey miliary tubercles.
54	Mesenteric glands.	„	19	3rd	58	15	„	511	1930	2720	K. 107	Very large cystic caseous lesion ; nearest glands normal. Lungs—Two grey tubercles. Kidneys—Caseating streak in one.
	Lung	„	19	3rd	58	10	„	512	1200	2150	K. 107	Small caseous lesion ; nearest glands normal. Lungs—Normal. Kidneys—A few surface pits and scars and caseo-pus in a calyx of one.
55	Mesenteric glands.	Direct	19	3rd	87	11	„	513	1370	2370	K. 113	Caseous softened lesion size of pigeon's egg ; nearest glands normal. Lungs—About 3 dozen caseous softened nodules from a pinhead to a small hempseed in size.
	Bronchial glands.	G.P.	19	3rd	49	12·5	„	514	1550	2600	K. 113	Caseous softened lesion size of hen's egg ; nearest glands normal. Lungs—About six miliary tubercles, some caseous.
58	Lung	Direct	15	3rd	51	25	„	482	1700	2210	K. 117	Large thin walled caseo-purulent abscess ; in one scapular gland a caseo-purulent cavity. Lungs—Scattered grey nodules caseous in centre up to 5 mm. and a small marginal patch.
	Mesenteric gland.	„	15	3rd	51	25	„	483	1790	2330	K. 117	Large caseous cyst ; each scapular gland contained a caseous tubercle. Lungs—moderate number scattered of tubercles and a few small marginal caseating patches. Kidneys—One pinhead tubercle.

TABULAR SUMMARIES OF EXPERIMENTS ON RABBITS WITH CULTURES—*continued.*

Rabbits inoculated with eugonic cultures—continued.

Number of case.	Origin of culture.	Whether direct or through G.P.	Details of culture.			Dose.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
			Age of sub-culture.	Generation.	Total period of cultivation.				Initial.	Final.		
			Days.		Days.	Mg.					Days.	
58 *cont.*	Bronchial glands.	Direct	15	2nd	51	13·6	Subcut.	484	1690	2730	K. 117	Very large local cyst; in one scapular gland a caseous focus. Lungs—Moderately numerous tubercles and nodules, caseous centrally, up to a hempseed, and some marginal and superficial caseating patches. Kidneys—Two submiliary tubercles.
59	Mesenteric glands.	G.P.	14	3rd	33	10	,,	499	1430	2160	K. 105	Small soft caseous lesion; scapular glands slightly enlarged, not caseous. Lungs—Contained scattered pinhead caseous tubercles. Kidneys—One contained a caseous focus.
	Bronchial glands.	,,	14	2nd	33	10	,,	500	1360	2000	K. 105	Thin-walled cyst filled with caseo-pus; one scapular gland contained a caseous focus or two. Lungs—Moderate number of caseating nodules up to split pea in size.
66	Mediastinal gland.	Direct	8	4th	60	10	,,	521	1400	2250	K. 113	Local caseous lesion; nearest glands normal. Lungs—Six tubercles and two small caseating nodules.
	Mesenteric glands.	G.P.	8	3rd	40	10	,,	522	1540	2740	K. 113	Local caseous lesion; nearest glands normal. Lungs—Two minute grey tubercles.
68	Bronchial glands.	,,	6	3rd	36	12	,,	535	1850	2760	K. 97	Local caseous lesion only.
71	Bronchial gland.	Direct	10	3rd	53	15	,,	533	2080	3120	K. 98	Caseous softened lesion size of hen's egg; nearest glands normal. Lungs—Contained about a dozen reddish-grey caseating nodules up to split pea in size.
	,,	,,	19	6th	96	10	,,	595	1270	2290	K. 93	Caseous and softened lesion size of hen's egg; nearest glands normal. Lungs—Scattered miliary and submiliary tubercles in the lungs.

73	Lung	G.P.	10	2nd	37	10	„	579	1590	2360	K. 96	Cystic caseous lesion of moderate size; nearest glands normal. Lungs—One caseating nodule size of split hempseed.
	„	„	10	2nd	37	12	„	580	2010	2730	K. 96	Cystic caseous lesion size of hen's egg; nearest glands normal. Lungs—Two tubercles.

Rabbits inoculated with a eugonic virulent strain.

31	Bronchial gland.	G.P.622 (Spln.)	16	5th	67	0·01	Intrav.	449	1900	1270	D. 29	General miliary tuberculosis.
	„	„	16	5th	67	0·01	„	450	1760	1220	D. 28	General miliary tuberculosis.
	„	„	16	5th	67	10	Subcut.	451	1950	1420	D. 37	Firm caseous lesion; nearest glands enlarged and caseous; general tuberculosis, severe in lungs.

Rabbits inoculated with dysgonic cultures.

31	Bronchial gland.	G.P.622 (Sternal gland).	10	4th	178	10	Subcut.	558	1650	1120	D. 54	Firm caseous lesion; nearest glands enlarged and caseous; general tuberculosis, severe in lungs.
	„	„	10	4th	178	10	„	559	1800	1420	D. 57	Firm large caseous lesion; nearest glands enlarged and caseous; general tuberculosis; lungs severely affected.
	„	G.P.621 (Omentum).	10	6th	199	10	„	560	1350	1060	D. 44	Caseous lesion; nearest glands enlarged and caseous; general tuberculosis; lungs severely affected.
	„	G.P.622 (Sternal gland).	17	5th	209	10	„	596	2510	1250	D. 67	Caseous breaking down lesion; nearest glands enlarged and caseous; general tuberculosis; lungs severely affected.
41	Mesenteric glands.	G.P.	19	5th	58	0·01	Intrav.	443	2620	1800	D. 29	General miliary tuberculosis.
	„	„	19	5th	58	9	Subcut.	444	1610	1090	D. 38	Caseous lesion and nearest glands; general miliary tuberculosis.
	„	„	19	5th	58	10	„	445	2000	1220	D. 40	Enormous caseous infiltrating tumour; nearest glands enlarged and caseating; slight early general tuberculosis.
	Bronchial glands.	„	19	5th	58	0·01	Intrav.	446	2050	1520	D. 30	General miliary tuberculosis.
	„	„	19	5th	58	10	Subcut.	447	1570	1180	D. 40	Firm infiltrating caseous lesion; nearest glands caseous; general tuberculosis.
	Lung	„	17	4th	53	10	„	475	1880	1430	D. 54	Local and severe general tuberculosis.

Tabular Summaries of Experiments on Rabbits with Cultures—*continued.*

Rabbits inoculated with dysgonic cultures—continued.

Number of case.	Origin of culture.	Whether direct or through G.P.	Details of culture.			Dose.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
			Age of sub-culture.	Generation.	Total period of cultivation.				Initial.	Final.		
			Days.		Days.	Mg.					Days.	
51	Mesenteric glands.	G.P.	17	4th	59	10	Subcut.	496	1970	1670	D. 53	Local and general tuberculosis, severe in lungs and kidneys.
	Lung	,,	17	4th	57	10	,,	497	1770	1480	D. 40	Local and general miliary tuberculosis.
	,,	,,	17	4th	57	10	,,	498	1190	1110	D. 47	Local and general miliary tuberculosis, severe in lungs.
	Spleen	,,	19	4th	63	10	,,	515	1740	1570	D. 78	Large caseous broken down lesion; nearest glands caseous. Severe general tuberculosis.
60	Mesenteric glands.	,,	8	5th	62	10	,,	523	1820	1570	D. 45	General miliary tuberculosis.
	Bronchial glands.	,,	8	4th	55	10	,,	524	1940	1380	D. 68	General tuberculosis.
62	Mesenteric gland.	Direct	20	4th	70	10	,,	516	2670	2320	D. 49	Local and general tuberculosis, very severe in lungs.
	Bronchial glands.	G.P.	14	4th	46	10	,,	534	1830	—	D. 7	Obstructed large bowel.
	,,	,,	Primary Culture		186	1·0	Intrav.	719	1980	1650	D. 13	Acute tuberculosis.
	,,	,,			,,	0·1	,,	720	1200	1030	D. 19	General miliary tuberculosis.
	,,	,,			,,	0·01	,,	721	1260	1170	D. 38	General miliary tuberculosis.
	,,	,,	6	3rd	175	10·0	Subcut.	740	1440	1180	D. 54	Local and general tuberculosis, severe in kidneys.
67	Mesenteric gland.	Direct	8	5th	66	10	,,	537	1540	1380	D. 37	Local tuberculosis and general miliary tuberculosis.
	,,	,,	8	5th	66	10	,,	538	1400	1250	D. 55	Local tuberculosis and general tuberculosis, severe in lungs and moderately severe in kidneys.

	Pharyngeal gland.	„	8	5th	66	10	„	539	1540	1600	D. 73	Ulcerated caseous lesion; nearest glands much enlarged, caseous throughout. Lungs contained a moderate number of caseous tubercles and about half a dozen caseating patches. Moderate number of tubercles in kidneys. A few in liver and spleen. Caseous nodules in tracheal, portal and popliteal glands. Unusually mild result for a standard bovine virus; strain therefore retested.
	„	„	8	9th	155	10	„	637	1800	1390	D. 37	Local and severe general miliary tuberculosis.
	„	„	8	9th	155	10	„	638	1550	1100	D. 31	Local and general miliary tuberculosis.
70	Mesenteric gland.	„	11	4th	54	10	„	536	2050	1960	D. 42	Local and severe general tuberculosis.
	Bronchial gland.	G.P.	9	5th	55	10	„	573	2150	1880	D. 73	Local tuberculosis and general tuberculosis, severe in lungs.
	„	„	9	5th	55	8·5	„	574	1870	1400	D. 99	Large firm caseous lesion; nearest glands caseous. Lungs—Crepitant, contained only a moderate number of discrete and in places conglomerate tubercles. Kidneys—Half a dozen nodules up to hempseed, latter projecting. No tuberculosis elsewhere. Unusually mild result for standard bovine virus; strain therefore retested.
	„	„	6	9th	152	10	„	709	1710	1720	D. 56	Local tuberculosis and general tuberculosis; severe in lungs and kidneys.
	„	„	6	9th	152	10	„	710	1410	1280	K. 61 (dying).	Local and general tuberculosis; severe in lungs and moderately severe in kidneys.

Tabular Summary of Experiments on Rabbits with Tissue Emulsions.

Number of case.	Material inoculated.	Method of inoculation.	Number of rabbit.	Weight in grammes.		Duration of life.	Result.
				Initial.	Final.	Days.	
41	Mesenteric glands ...	Subcutaneous	350	1750	1810	D. 97	Caseous lesion ; nearest glands enlarged and caseous : all other lymph glands showed tuberculous lesions. Lungs and kidneys severely tuberculous, liver and spleen slightly.
	Bronchial glands ...	Subcutaneous	351	2000	1540	D. 59	Local and severe general miliary tuberculosis.
45	Mesenteric glands ...	Subcutaneous	358	2120	2520	K. 97	Small caseous lesion ; nearest glands normal ; one tubercle in lungs.
51	Mesenteric glands ...	Subcutaneous	379	1970	1570	D. 68	Local and severe general tuberculosis.
	Spleen...	Subcutaneous	380	1620	—	D. 11	Cellulitis and acute infection.
54	Bronchial glands ...	Subcutaneous	399	1890	3060	K. 92	Small caseous lesion ; nearest glands normal. Lungs—Moderate number of caseating nodules. Kidneys—Two grey tubercles.
58	Bronchial glands ...	Subcutaneous	403	1560	1140	D. 70	Small caseous lesion ; nearest glands normal. Lungs—Contained about 30 caseating nodules up to a small pea and scattered small tubercles ; one lobe showed non-tuberculous pneumonia. Kidneys—One showed a grey focus.
60	Mesenteric glands ...	Subcutaneous	413	3610	2600	D. 83	Local and general tuberculosis. Lungs filled with nodules. Numerous typical " bovine " nodules in kidneys.
62	Mesenteric glands ...	Subcutaneous	428	1380	1570	K. 52	Local tuberculosis and moderate general tuberculosis.
67	Mesenteric glands ...	Intravenous	457	1230	770	D. 25	General miliary tuberculosis of moderate severity.
	Pharyngeal glands ...	Intravenous	458	900	790	D. 4	Slight pseudo-tuberculosis.

" Local tuberculosis " in the result column means that the rabbit had besides a local lesion tuberculosis of the nearest glands.

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